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FOREST FLORA
OF THE
**CHAKRATA, DEHRA DUN AND SAHA-
RANPUR FOREST DIVISIONS,**
UNITED PROVINCES

(BEING A REVISED AND ENLARGED EDITION
OF
THE FOREST FLORA OF THE SIWALIK AND
JAUNSAIR FOREST DIVISIONS, U. P.,

BY
UPENDRANATH KANJILAL, RAI BAHADUR, F.L.S.,
EXTRA DEPUTY CONSERVATOR OF FORESTS).

THIRD EDITION

BY

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PREFACE.

THIS "Forest Flora for the Chakrata, Dehra Dun and Saharanpur Forest Divisions" is under a new name the third edition of "The Forest Flora of the School Circle" originally prepared by Rai Bahadur Upendranath Kanjilal in 1901, the second edition of which was prepared by the original author in 1909. It was hoped that the Rai Bahadur would undertake this revision and when it was found that he was unable to do so, that his son would. Actually the revision has been prepared by Mr. Basant Lal Gupta, Assistant in the Botanical Branch at the Forest Research Institute.

The alterations made in the present edition are firstly the inclusion of a number of woody plants known to occur in the area. The detection of these omissions is due to a number of workers mainly Botanical Instructors at the Forest College. It was of course the existence of the first and second editions of Kanjilal's Flora that made it possible to add these plants, as had the Flora not been in existence woody plants found in the area but not included in the Flora would almost certainly have been overlooked instead of being specially collected and sent to the Herbarium at the Forest Research Institute. Secondly almost all species included in the second edition which are not represented by specimens from the area covered by the Flora have been excluded. Their inclusion in the Flora had in most cases been due to misidentification. Finally several genera such as *Ipomoea*, *Solanum*, *Smilax* and others have been more

fully dealt with and trees and shrubs commonly cultivated in gardens have been more adequately described.

The woody flora of this area is now practically completely known and additions in future will be due to introduced species becoming naturalized rather than to indigenous species having been overlooked. In the present edition 7 naturalized species have been added viz., *Malvastrum coromandelianum*, *Indigofera tinctoria*, *Cassia Sophera*, *Opuntia Dillenii*, *Argyrea Rowburghii*, *Solanum torvum* and *Datura fastuosa*. These appear to have spread considerably in the last few years. Many others more recently introduced have begun to run wild and have been incidentally mentioned. Some of these will doubtless become sufficiently common to deserve a place in the flora in any future edition.

A number of changes in names have been made. Hitherto the names used in the Flora of British India have mostly been adhered to. Students on leaving Dehra will now find that for most provinces local floras are available and few of them will ever use the Flora of British India. The names, therefore, have as far as possible been selected so as to agree with those used in more modern works where these differ from the Flora of British India. Many other changes in nomenclature should be made but a book intended for students is not the place in which such changes should be introduced.

R. N. PARKER,
Forest Botanist.

DEHRA DUN,
18th May 1927.

GLOSSARY

OF THE

BOTANICAL TERMS

USED IN THE TEXT.

Accrescent, increasing in size with age; usually said of parts of the calyx or corolla that persist and enlarge after flowering.

Achene, a small dry indehiscent 1-celled 1-seeded fruit, or a 1-seeded carpel of an apocarpous fruit.

Acicular, *needle-shaped*; long and slender.

Acorn, fruit of the oak, *i.e.*, a nut enclosed within a cup formed of an involucre of thickened bracts.

Aculeate, armed with prickles.

Acumen, a sharp tapering point more or less prolonged.

Acuminate, terminating in an *acumen*.

Acute, evenly tapering and ending in a narrow angle, but without a prolongation.

Adnate, said of dissimilar organs when congenitally united.

Adpressed, lying close against the producing surface.

Adventitious, occurring in an unusual position

Estivation, the mode in which the parts of a flower are folded in the bud; also their relative position.

Albumen, the nutritive substance found within the seed-coats of some seeds and outside the embryo.

Amplexicaul, said of a sessile leaf or the base of a petiole when *clasping* the stem.

Anastomosing, reticulately united.

Anatropous, said of an inverted ovule, *i.e.*, one with the *foramen* close to the hilum, and the *chalaza* at the opposite end the axis of the ovule itself remaining straight.

Androgynous, said of an inflorescence bearing both male and female flowers.

Annulate, marked transversely by *rings*.

Anterior, said of that part of a flower which is inserted away from the axis of inflorescence; *inferior*.

Anther, the part of a stamen that bears the pollen.

Apiculate, with a short pointed tip.

Apocarpous, with the carpels free and distinct.

Arborescent, attaining the size of a tree or resembling one.

Arcuate, shaped like a *bow*, i.e., moderately curved.

Aril, **arillus**, an accessory seed-covering or an appendage growing from or about the hilum of a seed. **Arillate**, having an *aril*. **Arillode**, a false *aril*.

Arista, an *awn* or bristle.

Aristate, bearing or terminating in an *arista*.

Articulate, jointed in such a manner as to separate at maturity.

Ascending, directed obliquely upward.

Auriculate, having a flat lateral expansion like the lobe of the ear.

Awn, a *bristle*-like appendage, especially of the glumes of

Axil, the upper angle formed by a leaf or a similar organ and the supporting stem or axis.

Axile, relating to the *axis*, generally said of a kind of placentation in which the ovules are borne on the central axis of the ovary.

Axillary in or relating to the *axil*.

Baccate, *berry*-like, pulpy.

Besifixed, *fixed* by the *base*, especially said of an anther attached at its lower end to

the top of the filament; *innate*.

Bast, fibrous inner bark.

Berry, a simple fruit succulent throughout, without a stone, and generally with more than one seed.

Bifarious, in two opposite vertical rows.

Bifid, divided into two segments to about the middle with a narrow sinus.

Bifurcate, *two-forked*, having two prongs or branches.

Bilabiate, having *two lips*.

Bipartite, divided into two segments almost to the base.

Bipinnate, *twice pinnate*.

Biseriate, in two series or rows, generally one above or within the other.

Bisexual, having both stamens and pistil in the same flower; hermaphrodite.

Biternate, *twice ternate*.

Blade, the lamina or flat part of a leaf.

Bole, the main axis or trunk of a tree.

Bract, a rudimentary or modified leaf subtending a flower or an inflorescence. **Bracteate**, having *bracts*.

Bracteole, a secondary *bract* or one of the ultimate grade subtending each flower of an inflorescence. **Bracteolate**, having *bracteoles*.

Bulb, a short stem, more or less conical above and flattened at the base, and usually underground, which bears a bud or buds concealed in fleshy scales or coats. **Bulbiform**, formed like a *bulb*. **Bulbous**, of the nature of the *bulb*.

GLOSSARY OF BOTANICAL TERMS.

Bulbil, a small bulb, usually applied to such as are produced in the leaf-axils of *Dioscoreas* or on the inflorescence of *Agave*.

Buttressed, said of stems with vertical ridges or projections, e.g., the stems of *Semal*, *Sundri*, etc.

Caducous, falling off very early.

Cæspitose, tufted or growing in tufts, e.g., many species of bamboos.

Callus, the new tissue which forms over the wounds of plants.

Calyptrate, when the calyx or corolla separates from the flower in the form of a cap as in some *Myrtaceæ*.

Calyx, the outer whorl of floral leaves, immediately below or outside the corolla. **Calycine**, relating to the *calyx*.

Calyptra, a *cap*, hood or veil.

Cambium, a zone of tender thin-walled cells separating the wood from the bark in Dicotyledons and Gymnosperms, by the division and growth of which new cells are formed.

Campanulate, *bell-shaped*, deeper than cup-shaped.

Canescent, with very short grey hairs or pubescence giving the epidermis a greyish-white hue.

Capitate, having a globose *head*.

Capitellate, diminutive of *capitate*.

Capitulum, a dense head of flowers.

Capsule, a dry syncarpous fruit the carpels of which open or separate at maturity.

Carpel, the ovary of an apocarpous pistil, or one of the component parts of a syncarpous ovary. **Carpellary**, relating to a *carpel*.

Cartilaginous, firm and tough like parchment.

Caruncle, an excrescence near the micropyle end of some seeds as in *castor oil*.

Caryopsis, a *grain*; the seed-like fruit of Gramineæ with thin pericarp, which is usually adnate to the contained seed.

Catkin, a scaly spike or raceme of unisexual flowers, pendulous or drooping, and generally deciduous.

Caudate, furnished with a *tail*, or with a slender *tail-like* terminal appendage.

Cauline, belonging to the stem.

Cell, the living vegetable unit; the structural unit in the formation of a plant. Also one of the *camities* of an ovary or of an anther.

Chalaza, that part of the ovule where the base of the nucellus is confluent with the coats.

Chartaceous, having the texture of writing *paper*; thin and flexible.

Ciliate, fringed with thick marginal hairs like the *eyelashes*.

Cirrhose, bearing *tendrils*.

Cladode, a branch, more or less flattened which assumes the form and functions of a *leaf*.

Clavate, *club-shaped*: slender below and gradually thickened upward.

Cocci, pl. of *coccus*, the seed-like and generally 1-seeded lobes of a syncarpous ovary

- which become more or less dry, and separate at maturity.
- Collateral**, placed side by side.
- Coma**, a tuft of soft hairs or cotton borne on a seed.
- Comose**, having a *coma*.
- Concolor**, of the same colour throughout.
- Conduplicate**, folded once upon itself lengthwise.
- Cone**, the multiple fruit of Conifers formed mostly of imbricated scales by which the seeds are subtended.
- Connate**, said of similar organs or parts of the same organ when congenitally united.
- Connective**, the portion of a stamen that connects the two lobes or cells of an anther.
- Connivent**, conniving, said of sepals, petals or anthers having the apex arching over or converging in the centre of the flower.
- Contorted**, convolute, said of leaves or petals with one margin within, and the other margin without, the whorl.
- Cordate**, heart-shaped, i.e., with the base shaped like the figure of a heart on cards.
- Coriaceous**, leathery; tough and thick.
- Corm**, a solid fleshy underground stem more or less jointed and naked or within thin scales, such as is characteristic of certain families, e.g., Ardisceæ.
- Corolla**, the inner whorl of floral leaves.
- Corona**, a crown; the crown-like process from the inner face of petals or the throat of a corolla, or from stamens.
- Cortical**, relating to the *cortex* or *bark*.
- Corymb**, an inflorescence of the indefinite or centripetal kind in which the branches or pedicels, although starting from different points, all attain almost the same level.
- Corymbose**, arranged in corymbs.
- Costate**, ribbed.
- Cotyledons**, the seed-lobes or first leaves of an embryo.
- Crenate**, with rounded teeth.
- Crustaceous**, hard and brittle; said of a covering which splits and breaks off easily.
- Culm**, the hollow and jointed stem of grasses, especially bamboos.
- Cuneate**, wedge-shaped, acute-angled at the base.
- Cupula**, cupule, a cup-like involucre of thickened bracts supporting the nut of the oak.
- Cupular**, belonging to, or shaped like, the involucre-cup.
- Cusp**, a long and tapering rigid point. **Cuspidate**, furnished with a *cusp*.
- Cuticle**, the outermost layer of the epidermis.
- Cyme**, an inflorescence of the definite or centrifugal type.
- Cypsela**, a dry inferior achene invested with the adnate calyx; the fruit of Compositæ.
- Decandrous**, with ten stamens.
- Deciduous**, said of trees or shrubs which are leafless for a part of the year; also of the leaves of such plants.
- Declinate**, bent to one side.

- Decomposed**, compound or divided more than once.
- Decurrent**, *running down* into; said of a sessile leaf when the blade is prolonged below the insertion and so *runs down* the stem.
- Decussate**, in pairs alternately crossing at right angles.
- Dehiscence**, the mode of opening of a capsule or of an anther.
- Deltoid**, triangular in outline or in section like the Greek letter Δ .
- Dentate**, with margins cut into triangular salient teeth directed outward. **Denticulate**, minutely toothed.
- Dextrorse**, turning or twining from left to *right*, *i.e.*, in the anti-clockwise direction.
- Diadelphous**, said of stamens united by their filaments into *two sets* or bundles.
- Dichotomous**, forked in pairs.
- Declinous**, applied to unisexual flowers.
- Didymous**, slightly 2-lobed or found in pairs.
- Didynamous**, said of a flower with two long and two short stamens, and also of stamens when they are such.
- Diffuse**, loosely spreading.
- Digitate**, *finger-like*; said of a compound leaf with the leaflets all borne on the apex of the common petiole.
- Dimorphic, dimorphous**, having *two forms*. generally said of hermaphrodite flowers having one form with long styles and short stamens, and another with short styles and long stamens; also of leaves if of two widely different shapes on the same stem.
- Dioecious**, unisexual with the male and female flowers on separate individuals.
- Disk**, a circular enlargement of the receptacle in the form of a cup, or of a cushion. **Discoid**, *disk-like*; circular and flat or depressed in the centre.
- Dissepiment**, a partition in an ovary or pericarp in the direction of its length.
- Distichous**, arranged in two opposite vertical rows.
- Divaricate**, spreading widely apart.
- Dorsal**, relating to, inserted on, or opening by, the *back* or outer suture.
- Drupe**, a stone-fruit, *i.e.*, one with a fleshy or pulpy pericarp and a bony or crustaceous endocarp. **Drupaceous**, like a *drupe*.
- Ebracteate**, without *bracts*.
- Ebracteolate**, without *bracteoles*.
- Echinate**, set all round with sharp bristles like a *hedge hog*.
- Eglandular**, without *glands*.
- Elliptic, elliptical**, oblong or oval with rounded ends.
- Ellipsoid**, a solid with an elliptical outline.
- Emarginate**, with a notch at the apex.
- Embryo**, the rudimentary plantlet formed in a seed.
- Endocarp**, the inner layer of the pericarp.
- Endosperm**, the albumen of a seed.
- Ensiform** in the shape of a *sword*.

- Epicalyx**, a whorl of bracts below the *calyx* proper and somewhat resembling it in shape and colour.
- Epicarp**, the outer layer of a pericarp.
- Epidermis**, the outermost layer of tissue or skin of a plant.
- Epigynous**, inserted on the top of the *ovary*.
- Epipetalous**, said of stamens which are borne on, or adnate to, the *petals* or corolla.
- Epiphyllous**, growing *on leaves* or perianths.
- Epiphyte**, a plant growing on, but not nourished by, another plant. **Epiphytic**, having the habit of an *epiphyte*.
- Erose**, irregularly toothed as if bitten.
- Exalbuminous**, without *albumen*.
- Excavate**, hollowed into broad deep pits.
- Exocarp**, the external layer of the pericarp when an endocarp is present.
- Exstipulate**, without *stipules*.
- Extrorse**, applied to anthers that dehisce towards the circumference of the flower.
- Falcate**, curved like the blade of a *sickle* or *scythe*.
- Family**, a group of co-related genera which are sometimes grouped into tribes.
- Farinaceous**, consisting of or resembling *starch*.
- Fascicled**, **fasciculate**, in dense clusters.
- Ferruginous**, colored like *iron rust*.
- Fibrovascular**, said of a tissue consisting of woody fibres and ducts or vessels
- Filament**, the stalk of an anther.
- Filiform**, *thread-like*; long and slender.
- Fimbriate**, having a *fringe* or border of fine thread-like processes.
- Fistular**, hollow.
- Flabellate** or **Flabelliform**, fan-shaped.
- Flexuous**, wavy, zig-zag.
- Floccose**, woolly with locks of dense soft hairs that are easily detached.
- Foliaceous**, of the form or texture of a leaf.
- Follicle**, a fruit of a single carpel opening by only one, usually the inner suture. **Follicular**, pertaining to or resembling a *follicle*.
- Foveolate**, impressed with small pits.
- Free**, distinct, not adnate to any other organ. **Free-central**, said of the placenta of a one-celled ovary when it is like a column in the centre bearing ovules on the upper extremity.
- Fugacious**, falling off or fading very early.
- Fulvous**, tawny.
- Funicle**, the stalk of an ovule or seed.
- Furcate**, forked.
- Fusiform**, *spindle-shaped*; solid and tapering at both ends.
- Gamopetalous**, having *combined petals*.
- Gamophyllous**, said of a flower having a perianth of *united leaves* or segments; also applied to such a perianth.
- Gamosepalous**, having *combined sepals*.

- Genus**, pl. **genera**, a group of closely related species indicated by the first name of a plant.
- Gibbous**, having a *pouch-like* swelling or protuberance on one side.
- Glabrous**, without hairs of any kind. **Glabrate**, somewhat *glabrous*. **Glabrescent**, becoming *glabrous*.
- Glands**, small *wart-like* bodies or round *excrescences* of any kind found on stems, petioles, etc., or inside flowers. Small raised superficial *dots*, or minute *vesicles* imbedded in the substance of leaves, etc., usually filled with oil.
- Glandular**, having *glands*, or relating to *glands*.
- Glaucous**, of a bluish-grey colour, often covered with a fine bloom.
- Globose**, somewhat sphaerical.
- Glaucouscent**, somewhat glaucous.
- Glumes**, the chaffy bract-like *scales* of the inflorescence of grasses and their allies.
- Glumaceous**, resembling or relating to *glumes*.
- Glochidiate**, clothed with barbed bristles.
- Glutinous**, sticky.
- Gonophore**, a stipe or stalk supporting both stamens and ovary in a flower.
- Gynæcium**, the pistils or carpels of a flower collectively.
- Gynobase**, a short and broad elongation of the torus on which the pistil rests. **Gynobasic**, resting on a *gynobase*.
- Gynophore**, the stipe or stalk supporting an ovary.
- Hastate**, shaped like the head of a spear.
- Haustorium**, pl. *haustoria*, a sucker-like root by means of which a flowering parasite draws nourishment from its host.
- Hermaphrodite**, bisexual; having both stamens and pistil in the same flower.
- Heterogamous**, said of flower-heads when male, female, bisexual and neuter florets, or any two or three of these, are borne on the same head.
- Heterophyllous**, having differently shaped leaves on the same plant.
- Hilum**, the place of attachment of an ovule or seed to the placenta or funicle.
- Hirsute**, thickly covered with long and rather coarse hairs.
- Hispid**, beset with rigid or bristly hairs.
- Homogamous**, said of a flower-head with the florets all of the same sex.
- Hyaline**, transparent or translucent and colourless.
- Hypocrateriform**, *salver-shaped*; said of a corolla with a slender tube abruptly expanded into a flat horizontal limb.
- Hypogynous**, inserted *below* the ovary.
- Imbricate**, overlapping so as to break joints like *tiles* on a roof.
- Imparipinnate**, *unequally pinnate*; pinnate with a terminal leaflet or pinna.
- Incised**, cut sharply and irregularly.

GLOSSARY OF BOTANICAL TERMS.

Incomplete, said of a flower wanting calyx or corolla or both.

Indefinite, too many to be readily counted.

Indehiscent, not opening in a regular manner.

Indumentum, a general term for any kind of hairy covering, or coating produced by the epidermis.

Induplicate-valvate, said of members of a whorl when they touch one another with the margins of each folded inward.

Inferior, inserted below the ovary and free from it, if said of the calyx; adnate to or situated below the calyx, if said of the ovary; also anterior, when said of the relative position of the parts of a flower in an inflorescence.

Inflorescence, the mode in which flowers are arranged on the stem. Also used as a collective term for the whole flowering portion of the stem of a plant with its branches, bracts, bracteoles and flowers.

Infundibuliform, funnel-shaped.

Integuments, the coats of an ovule or seed.

Interpetiolar, said of stipules of opposite leaves and inflorescences when they are inserted between the petioles, i.e., across the stem.

Intrapetiolar, is applied to stipules of single leaves when they are connate by their margins so as to form apparently one stipule.

Introise, applied to anthers that dehisce towards the pistil.

Involucre, a circle of bracts subtending a flower-cluster.

Involute, rolled inward.

Irregular, wanting in symmetry of form, said of flowers with the petals or perianth-segments unequal in size and shape.

Keel, the central dorsal ridge, like the prow of a boat, formed by the two anterior and innermost petals of a papilionaceous corolla.

Labiate, two-lipped.

Laciniate, irregularly cut or fringed into narrow lobes or segments with narrow sinuses.

Lacunose, marked with minute pits or depressions.

Lanceolate, shaped like a lance-head, i. e., 2-4 times as long as broad, narrowed at both ends, especially towards the apex, and broadest below the middle.

Lax, diffuse, said of an inflorescence when the flowers or fruits are not closely arranged on it.

Legume, a fruit of a single carpel usually opening by both sutures when ripe. See **Pod**.

Lenticel, a lentil-shaped corky process developed on the bark of some trees. **Lenticellate**, having lenticels.

Lenticular, lentil-shaped; like a double-convex lens.

Lepidote, covered with scurfy scales.

Ligule, anything shaped like a strap, such as the limb of the ray-corolla in some Compo-

- sitæ.** The thin and scarious projection from the summit of the sheath of the leaf of grasses. **Ligulate**, *strap-shaped*, usually applied to the ray-flowers of *Compositæ*.
- Limb**, the expanded portion of a gamopetalous corolla or the blade of a clawed petal or leaf.
- Linear**, narrower than lanceolate,—at least five times as long as broad.
- Lip**, one of the two divisions of a bilabiate calyx or corolla.
- Lobulate**, divided into *small lobes*.
- Loculicidal**, applied to a kind of dehiscence in which the splitting takes place through the *cells*.
- Locus**, the cell of an ovary; pl. **loculi**.
- Lodicule**, one of the small scales which represent the perianth in the flower of a grass, occurring usually in pairs.
- Lyrate**, pinnately lobed with a large terminal lobe and one or more pairs of small basal lobes, so as to resemble a *lyre*.
- Mammillate**, having *nipple-like* prominences.
- Marcescent**, withering without falling off.
- Medullary** rays, vertical plates of cellular tissue which radiate from the centre of a dicotyledonous plant towards the cambium.
- Mesocarp**, the middle layer of the pericarp.
- Micropyle** the *minute orifice*. in the coats of a seed represented by a scar, corresponding to the foramen of an ovule.
- Monadelphous** said of stamens united by their filaments into *one set* forming a tube or column or sheath.
- Moniliform**, cylindrical and constricted at regular intervals so as to resemble a *necklace* of beads.
- Monoecious**, unisexual with the male and female flowers on the same individual.
- Monopodial**, pertaining to or of the nature of a *monopodium*, i.e., a simple axis prolonged by means of a terminal bud.
- Mucronate**, abruptly terminating in a short straight stiff and sharp point.
- Multifarious**, in *many vertical rows*.
- Multifid**, cleft into *many lobes* or segments.
- Multiseriate**, in *many series* or rows.
- Muricate**, rough with hard tubercles.
- Muticous**, blunt, awnless.
- Needles**, the acicular leaves of conifers.
- Nerves**, the principal lateral ribs of a leaf. **Nervose**, with nerves strongly developed.
- Nucleus**, the central part of an ovule or cell; pl. **nuclei**.
- Nut**, a hard indehiscent 1-seeded fruit resulting from a syncarpous ovary.
- Nutlet**, diminutive of nut.
- Obconic**, inversely *conical*, i.e., with the attachment at its pointed end.

Obcordate, inversely *cordate*, i.e., broadly two-lobed with a notch at the apex.

Ob lanceolate, inversely *lanceolate*, i.e., long, narrow and tapering at both ends, but broadest above the middle.

Oblanceoloid, said of a solid having an *oblanceolate* outline.

Oblong, much longer than broad with the sides nearly parallel.

Obovate, inversely *ovate*, i.e., egg-shaped in outline with the broad end towards the apex.

Obovoid, said of a solid which is inversely egg-shaped in outline.

Obsolete, rudimentary, imperfectly developed.

Obtriangular, in the shape of an isosceles *triangle* with the attachment at the apex.

Operculum, a *lid*; a top which separates by a transverse line of separation.

Orbicular, *orbiculate*, flat with the outline circular or nearly so.

Order, a group of closely related Families of plants.

Ovary, that portion of the pistil which includes one or more cavities or cells containing one or more *ovules*.

Ovate, *egg-shaped* in outline with the broad end towards the base.

Ovoid, said of a solid with an ovate or oval longitudinal section.

Ovule, the immature or undeveloped seed in the *ovary*.

Palea, the innermost glume of the flower of a grass, or the chaffy scales on the receptacles

of many *Compositæ*. **Plaeaceous**, *chaff-like*.

Palmate, with the midribs of the lobes or leaflets all radiating from the apex of the petiole.

Palmatilobed, *palmately lobed*.

Palminerved, with nerves radiating like ribs of a palmate leaf. **Palmatipartite**, with segments palmately separated almost to the base.

Pandurate, *fiddle-shaped*.

Panicle, an inflorescence in which the axis is divided into branches bearing two or more flowers; a compound raceme or compound irregular corymb.

Papilionaceous, *butterfly-like*; applied to the kind of corolla characteristic of the Pea tribe of Leguminosæ; like the flower of the Pea tribe. See **Keel**, **Wings** and **Standard**.

Papillose, bearing minute *nipple-shaped* projections.

Pappus, thistle-down; the hairy tufts on achenes and other fruits.

Parasite, a plant that grows on or in another plant, and draws nourishment from it.

Parietal, attached to the inner wall of an ovary.

Paripinnate, *sy1. abruptly pinnate, evenly pinnate*; pinnate without the terminal leaflet or pinna

Patent, widely *spreading*.

Pectinate, *pinnatifid* like a comb with narrow close set segments.

Pedate, like a bird's foot; palmately divided with the lateral divisions 2-cleft.

Pedice*l*, the ultimate stalk supporting a single flower in an inflorescence. **Pedicellate**, having a *pedice**l*.

Peduncle, the stalk supporting a solitary flower or fruit or a cluster of flowers or fruits.

Pedunculate, having a *peduncle*.

Pellucid, transparent or translucent.

Peltate, *target-shaped*: said of a flat body, generally a leaf, a bract or a stigma, attached to the stalk by the lower surface.

Penninerved, *pinnately nerved*; with nerves spreading laterally from various points on the midrib.

Pentamerous, having the members in each whorl of the flower in *five*s.

Penultimate, next to the *ultimate*.

Perianth, a floral envelope; a term especially used when the calyx and corolla are similar in form and texture, or are represented by a single whorl.

Pericarp, the portion of the fruit formed of the ovary and whatever adheres to it, exclusive of, and outside, the seeds.

Perigynous, inserted *around* but away from the *ovary*.

Persistent, remaining attached; generally said of a calyx or a corolla which remains attached until the fruit is mature.

Petal, one of the parts or leaves of the corolla, whether free or combined. **Petaloid**, resembling or having *petals*.

Petiole, the stalk of a leaf. **Petiolate** having a *petiole*.

Petiolule, the stalk of a leaflet.

Petiolulate, having a *petiolule*.

Phlôm, the soft tissue of the inner bark which is formed by the outer portion of a vascular bundle.

Pilose, thinly sprinkled with long soft simple hairs.

Pinna, pl. *pinnæ*, the primary division of a bipinnate or tripinnate leaf. **Pinnule**, the secondary division of a tripinnate leaf.

Pinnate, a compound leaf is so called when the leaflets are arranged on either side of a common axis in the same way as are the webs of a *feather* on its shaft.

Pinnatisect, *pinnately cut* nearly to the common axis.

Pistil, the female organ of a flower consisting normally of ovary, style and stigma.

Pistillode, a rudimentary or barren pistil.

Placenta, that portion of the interior of an ovary on which the ovules are borne.

Plaited, *plicate*, folded in longitudinal *plaits*.

Plumose, *feathered*; said of bristles having fine hairs on either side like the *plume* or webs of a feather.

Pod, the same as **Legume**, but has a wider application, being used to denote any dry dehiscent many-seeded fruit, especially when it is much longer than broad.

Pollen, minute, *powder-like* grains contained in the anther-cells,—the fertilizing agent of a plant.

- Polyadelphous**, having the stamens united by the filaments into *many sets* or bundles.
- Polygamous**, with hermaphrodite and unisexual flowers on one or different plants.
- Polyphyllous**, said of a perianth having *distinct leaves* or segments.
- Pome**, a succulent fruit with seeds in many cartilaginous dry cells, *e.g.*, the apple and the pear.
- Posterior**, said of that part of a flower which is nearest to the axis of inflorescence; superior axis of inflorescence; superior.
- Prickle**, a sharply-pointed stiff outgrowth of the epidermis.
- Procumbent**), lying flat or close
Prostrate) to the ground.
- Pruinose**, covered with a *hoar-frost-like* bloom or powder.
- Pseudocarp**, a *false fruit*; one which has some portion other than the ovary so developed as to resemble a fruit.
- Pubescent**, covered with short soft straight simple *hairs*.
- Puberulous**, **puberulent**, minutely *pubescent*.
- Punctate**, dotted with small *punctures* or glands. **Punctulate**, minutely *punctate*.
- Pungent**, terminating in, or tapering gradually to, a hard sharp point.
- Pustular**, with small *blister-like* elevations.
- Putamen**, the shell of a nut; the hard endocarp of a drupe.
- Pyrene**, one of the small stones of a drupaceous fruit having more than one stone.
- Pyriform**, *pear-shaped*; obovoid with a tapering base.
- Raceme**, an inflorescence of the indefinite kind in which the flowers are borne on pedicels of more or less the same length along a single undivided axis or rachis.
- Rachis**, the principal axis of a pinnate leaf or of an inflorescence. **Rachillum**, pl. *rachilla*, the *secondary rachis* of a compound spike; the *rachis* of a spikelet of grass.
- Radicle**, the axis of an embryo below the cotyledons.
- Radical**, proceeding from or near the root.
- Raphe**, the cord or ridge which connects the hilum with the chalaza in an anatropous ovule.
- Raphides**, needle-shaped crystals found in the cells of some plants.
- Ray**, one of the radiating branches of an umbel. **Ray-flowers**, the marginal ligulate flowers of a head or circular flower-cluster.
- Receptacle**, the torus of a flower; hence also what is commonly known as the *fruit* of figs.
- Regular**, symmetrical; generally said of flowers with the petals or perianth-segments alike in size and shape.
- Reniform**, *kidney-shaped*; *i.e.*, broader than long, broadly cordate at the base, and with the auricles rounded.
- Repand**, having a wavy margin.

Reticulate, having the veins connected together like the meshes of a *net*.

Retuse, with a small shallow notch in a rounded or truncate apex.

Revolute, having the margins or apex rolled backward upon the under surface.

Rhizome, an underground or prostrate jointed stem which sends off roots at the nodes and bears, like a true stem, buds, leaves, or scales.

Rhomboid, **rhomboidal**, with four sides more or less equal, and the lateral angles obtuse.

Rostrate, *beaked*; narrowed into a slender tip or process.

Rotate, *wheel-shaped*; said of a regular gamopetalous corolla with a short tube and a flat spreading limb.

Rotundate, circular or nearly so in outline.

Rugose, full of wrinkles.

Rugulose, minutely wrinkled.

Ruminate, mottled; marked by transverse lines or divisions.

Sagittate, shaped like an *arrow-head*; tapering towards the apex, bifurcate at the base, with the lobes pointed and directed downward.

Samara, an indehiscent dry winged fruit.

Sarmentose, producing long straggling woody branches.

Scabrous, rough to the touch owing to short stiff hairs.

Scaberulous, somewhat *scabrous*.

Scape, a leafless and generally unbranched flower-stem rising from the ground.

Scapigerous, with flowers borne on a scape.

Scarious, **scariose**, thin, dry, membranous, somewhat stiff and not green.

Scorpioid, said of a form of unilateral inflorescence which is coiled inward from the apex in the bud like the tail of a *scorpion*.

Sepal, one of the parts or leaves of the calyx, especially when not combined.

Sepaloid, resembling a sepal.

Septicidal, dehiscing through the dissepiments or lines of junction.

Septifragal, opening by the valves breaking away from the dissepiments.

Septum, pl. **Septa**, *see* **Dissepiment**, **Septate**, divided by one or more partitions.

Serrate, toothed like a *saw* with the teeth directed forward.

Serrulate, minutely *serrate*.

Sessile, attached directly without a stalk.

Setaceous, *bristle-like*.

Sheath, a close-fitting tubular or enrolled case, *e.g.*, the lower portion of the leaf of grasses.

Sigmoid, curved in two opposite directions like the Greek letter *sigma* or ς .

Simple, undivided; consisting of one blade when said of a leaf; resulting from a single pistil when said of a fruit; unbranched when said of a stem or tendril.

Sinistrorse, turning or twining from right to *left*, *i.e.*, in the clock-wise direction.

- Sinus**, the space between the divisions or lobes of a leaf.
- Sinuate**, with an irregular wavy margin.
- Spadix**, a spike bearing a thickened or fleshy axis bearing 1-sexual flowers, generally sheathed in a *spathe*.
- Spathe**, a large sheath-like bract enclosing a spadix. **Spathaceous**, *spathe-like*.
- Spathulate**, shaped like a *spatula*, i.e., broad and rounded at the apex but gradually narrowed towards the base.
- Species**, a group of individuals alike in all essential particulars; the subdivisions of a genus.
- Spike**, a form of indefinite inflorescence bearing sessile flowers on an undivided elongated common axis.
- Spicate**, in the form of or resembling a *spike*, or disposed in *spikes*. **Spikelet**, a secondary *spike*; the ultimate flower-bearing stem of grasses including its glumes and flowers.
- Spine**, a strongly pointed woody process generally originating from the wood-tissue.
- Spinescent**, terminating in, or resembling, a *spine-like* sharp point; also becoming spinous. **Spinose**, **spinous**, furnished with or of the nature of *spines*.
- Spore**, a minute unicellular body which detaches at maturity and performs, practically speaking, the same function in Cryptogams as the *seed* in Phanerogams.
- Stamen**, the male organ of a flower, consisting of a filament and an anther. **Staminate**, an abortive or antherless stamen.
- Standard**, the posterior or odd petal of a papilionaceous corolla.
- Stellate**, *star-shaped*; with radiating rays like the points of a star.
- Stigma**, that part of the pistil which receives the pollen for the fertilization of the ovules.
- Stigmatic**, relating to the *stigma*.
- Stigmatose**, resembling or of the nature of the *stigma*.
- Stipe**, any stalk-like support; the stalk of an ovary above the floral whorls. Syn. **gynophore**, **Stipitate**, having a *stipe*.
- Stipule**, an appendage of a leaf, usually one on either side of the petiole. **Stipulate**, having *stipules*. **Stipel**, a secondary *stipule*, the appendage of a leaflet. **Stipellate**, having *stipels*.
- Stomata**, pl. of **Stoma**, openings in the epidermis of plants with adaptations for regulating the passage of air and moisture.
- Stone**, the hard endocarp of a drupe. Syn. **Putamen**.
- Striate**, marked with thin longitudinal lines or minute furrows.
- Strigose**, covered with sharp-pointed straight stiff hairs of unequal length lying close along the surface, and all in the same direction.
- Style**, a *stalk* proceeding from the summit of the ovary and supporting the stigma.

Subulate, shaped like a cobbler's awl; narrow, tapering and somewhat stiff.

Sulcate, grooved or furrowed.

Superior, inserted on the ovary or adnate to it, if said of the calyx; above the calyx and free from it, if said of the ovary; also posterior in position.

Suture, a seam indicating the line of union of two parts; a line of opening.

Symmetrical, said of a flower having the same number of members in each whorl.

Syncarpous, composed of two or more combined carpels.

Syngenesious, said of stamens united by their anthers, as in Compositæ.

Tendril, a slender process usually belonging to the axis and serving as a support in climbing.

Terete, cylindrical, rounded in cross section.

Ternate, arranged in threes in a cluster or whorl.

Testa, the outermost coat of a seed.

Tetramerous, said of a flower having the parts or members in each whorl in fours.

Tetrandrous, with four stamens.

Thalamus, that part of the axis of a flower which supports the floral whorls and the pistil. Syn. **torus**, receptacle.

Thyrus, or **thyrs**, a panicle, ovate or lanceolate in outline usually with cymose branches.

Thyriform, of the shape of a *thyrs*. **Thyrseoid**, somewhat like a *thyrs*.

Tomentose, covered with hairs which are very short, soft, rather dense and more or less intricate.

Torulose, cylindrical with contractions at regular intervals.

Torus, same as **receptacle** or **thalamus**.

Tribe, a division of a Family comprising a number of closely related genera.

Trichotomous, with the divisions always in threes and of more or less the same length.

Trimerous, said of a flower having the parts or members in each whorl in threes.

Trimorphic, having three forms of hermaphrodite flowers produced by the same species, but generally on different individuals. See **dimorphic**.

Triplinerved, with a strong secondary nerve on either side of the midrib proceeding from near the base.

Triquetrous, sharply three-cornered.

Tristichous, in three vertical rows.

Truncate, ending abruptly, as if with the end cut off.

Tuber, a thickened underground stem bearing buds or 'eyes.' **Tuberous**, swollen like a tuber.

Tumid, swollen.

Turbinate, top-shaped; like an inverted cone.

Turgid, swollen and more or less firm.

Umbel, a form of indefinite inflorescence in which several branches or pedicels radiate

from the top of a common peduncle and are of nearly the same length.

Undulate, with a wavy margin.

Unicellular, formed of, or consisting of, only *one cell*.

Unisexual, of *one sex*; having the stamens and the pistil in separate flowers.

Urceolate, *urn-shaped*; tubular and contracted at or below the mouth.

Utricle, a 1-celled 1-seeded fruit with a thin and more or less loose pericarp.

Valvate, with the margins of the members of a whorl only meeting without overlapping. Also dehiscing by *valves*.

Variety, a group of individuals differing from others of the same species in certain striking particulars which, however, are not of a nature to justify specific rank; subdivisions of a species.

Venation, the mode in which the *veins* are disposed in a leaf.

Ventral, relating to, inserted on, or opening by, the inner suture of a carpel.

Ventrickle, a lateral swelling or bulging out. **Ventricose**,

having a *ventricle*; unequally swollen.

Verrucose, covered with wart-like excrescences.

Versatile, swinging to and fro; said of an anther attached by the back to the top of the filament.

Verticillate, arranged in whorls.

Villous, more or less thickly covered with long soft simple hairs.

Virgate, twiggy or rod-like.

Viscid, sticky.

Viviparous, said of plants the seeds of which germinate before falling; also sometimes of such seeds.

Whorl, a collective name for all similar members that are arranged in a circle round an axis.

Wing, any thin membranous appendage. **Wings**, the side petals of a papilionaceous corolla.

Xylem, woody tissue which is formed by the inner portion of a fibrovascular bundle.

Zygomorphic, applied to flowers which can be divided into similar halves in one plane only.

FOREST FLORA OF THE CHAKRATA, DEHRA DUN AND SAHARANPUR FOREST DIVISIONS.

VEGETABLE KINGDOM.

Seed-bearing plants. Fertilization

effected by pollen-tubes

Ovules in closed ovary, fertilized
through stigma

Cotyledons two; radicle elongated
to form the primary root

Calyx and corolla both present.¹

Corolla of distinct petals²

Calyx of distinct sepals³;
petals hypogynous.

Torus small or elongated,
not expanded

Torus thickened or ex-
panded into a fleshy
disk⁴

Calyx of combined sepals;
disk thin; petals and
stamens inserted on the
calyx

Corolla of combined petals⁵

I. PHANEROGAMS.

A. ANGIOSPERMS.

a. DICOTYLEDONS.

i. POLYPETALÆ.

1. Thalamifloræ.

2. Discifloræ.

3. Calycifloræ.

ii. GAMOPETALÆ.

¹ *Exceptions*.—Petals wanting in some RANUNCULACEÆ, BIXACEÆ and STERCULIACEÆ among the THALAMIFLORÆ; in some RUTACEÆ, CELASTRACEÆ and RHAMNACEÆ among the DISCIFLORÆ; and in a few COMBRETACEÆ, MYRTACEÆ and SAMYDACEÆ among the CALYCIFLORÆ.

² *Exceptions*.—Petals more or less combined in some TAMARICACEÆ and TERNSTROMIACEÆ among the THALAMIFLORÆ; in some OIACACEÆ; ILICACEÆ and VITACEÆ among the DISCIFLORÆ; and in sub-family MIMOSEÆ of LEGUMINOSÆ among the CALYCIFLORÆ.

³ *Exceptions*.—Sepals combined in DIPTEROCARPACEÆ, MALVACEÆ and STERCULIACEÆ among the THALAMIFLORÆ and in BURSERACEÆ, MELIACEÆ, SAPINDACEÆ and some RUTACEÆ, RHAMNACEÆ and ILICACEÆ among the DISCIFLORÆ.

⁴ *Exceptions*.—Disk obsolete in ILICACEÆ, obscure in LINACEÆ and MALPIGHIACEÆ and wanting in CORIARIACEÆ.

⁵ *Exceptions*.—Petals free in some MYRSINACEÆ and STYRACEÆ.

• Menu

VEGETABLE KINGDOM—*contd.*

Perianth single (and generally calycine), or none ¹ . . .	iii. APETALÆ.
Cotyledon one ; radicle not elongated to form the primary root . .	b. MONOCOTYLEDONS.
Ovules exposed, fertilized by direct contact with pollen-tubes . . .	B. GYMNOSPERMS.
Spore-bearing plants. Fertilization not effected by pollen-tubes . . .	II. CRYPTOGRAMS.

¹ *Exceptions.*—A few plants of Family EUPHORBACEÆ and the female flowers of Genus *Juglans* of family JUGLANDACEÆ have both calyx and corolla; and the perianth is double in Genus *Loranthus* of LORANTHACEÆ.

* The CRYPTOGRAMS are not treated in this Flora.

A. ANGIOSPERMS.—

a. DICOTYLEDONS.—

i. POLYPETALÆ.—

1. Thalamifloræ.

Stamens indefinite.

Carpels more or less distinct or solitary¹; stamens free.

Herbs or soft-wooded climbing shrubs

1. RANUNCULACÆ.

Generally trees or woody shrubs, rarely climbing (e. g., *Schizandra* of Order 3).

Sepals and petals usually 5, each in a single whorl, the former persistent

2. DILLENIACÆ.

Sepals and petals in threes, the latter in several whorls, both deciduous.

Stipules² convolute; albumen even

MAGNOLIACÆ.

Stipules 0; albumen ruminant

ANONACÆ.

✓ Carpels combined.

Calyx-lobes imbricate in bud.

Leaves opposite, gland-dotted; stamens 3-or 5-adelphous

11. HYPERICACÆ.

Leaves alternate, not dotted; stamens usually free.

Placentas axile

12. TERNSTROMIACÆ.

Placentas parietal.

Ovary long-stipitate seeds exalbuminous

CAPPARIDACÆ.

Ovary sessile; seeds albuminous

BIXACÆ.

Calyx lobes valvate in bud.

Calyx irregular, adnate to the ovary, lobes enlarged in fruit

13. DIPTEROCARPACÆ.

Calyx regular, free, lobes not enlarged.

Stamens monadelphous.

Anthers 1-celled

14. MALVACÆ.

Anthers 2-celled

15. STERCULIACÆ.

¹ Carpels combined in Genus *Anona* of Family ANONACÆ.² Stipules absent in Genus *Schizandra*.

1. *Thalamifloræ*—*contd.*

- Stamens distinct; anthers 2-
celled 16. TILIACEÆ.
- Stamens few, never more than 10.
(Carpels more or less distinct in fruit).
Flowers 3-merous.
Flowers minute; seeds curved . . . 5. MENISPERMACEÆ.
Flowers conspicuous; seeds not
curved 6. BERBERIDACEÆ.
- Flowers 5-merous.
Leaves fairly large; seeds not
winged 9. PITTOSPORACEÆ.
Leaves minute (scale-like); seeds
winged 10. TAMARICACEÆ.

A. ANGIOSPERMS.—

a. DICOTYLEDONS.—

i. POLYPETALÆ.—

2. Discifloræ.

Placentas axile; fruit not elongated.

Styles 1-5, quite free; filaments often connate at the base.

Leaves alternate; fruit not winged 17. LINACEÆ.

Leaves opposite; fruit winged 18. MALPIGHIACEÆ.

Styles more or less combined or solitary; stamens generally free.

Flowers symmetrical.

Calyx imbricate.

Torus elongated in fr below the ovary.

Leaves dotted, aromatic; carpels combined (except in *Zanthoxylum*) 19. RUTACEÆ.

Leaves not dotted, bitter or astringent; carpels distinct.

Leaves alternate; stem terete 20. SIMARUBACEÆ.

Leaves opposite; stem 4-angular 31. CORIARIACEÆ.

Torus not elongated below the ovary.

Plants resinous.

Leaves dotted; fruit usually with more than one seed 21. BURSERACEÆ.

Leaves not dotted; fruit 1-seeded (except in *Spondias*) 30. ANACARDIACEÆ.

Plants not resinous.

Stamens opposite to the petals 29. SABIACEÆ.

Stamens alternating with the petals.

Disk obsolete 24. ILICACEÆ.

Disk conspicuous 25. CELASTRACEÆ. /

Calyx valvate.

(Disk prominent; stamens opposite to the petals.)

2. *Discifloræ*—*contd.*

- | | |
|--|-----------------|
| Wood usually hard and close-grained, joints not swollen | 26. RHAMNACEÆ. |
| Wood always soft and porous, joints swollen | 27. VITACEÆ. |
| Flowers not symmetrical (except in <i>Staphylea</i>), calyx imbricate | 28. SAPINDACEÆ. |
| Style solitary; stamens monadelphous (except in <i>Cedrela</i>); flowers symmetrical; calyx imbricate | 22. MELIACEÆ. |
| Placentas free-central; fruit not elongated | 23. OLACACEÆ. |
| Placentas parietal; fruit a 3-valved elongated pod-like capsule | 32. MORINGACEÆ. |

A. ANGIOSPERMS.—

a DICOTYLEDONS.—

i. POLYPETALÆ.—

3. Calycifloræ.

Calyx inferior, free¹; leaves with or without stipules.

Leaves stipulate.

Carpels distinct or solitary².

Fruit a pod; calyx with the odd lobe inferior, *i.e.*, anterior . . . 33. LEGUMINOSÆ.

Fruit various, not a pod; calyx with the odd lobe superior, *i.e.*, posterior . . . 34. ROSACEÆ.

Carpels more or less combined.

Leaves alternate, usually dotted . . . 41. SAMYDACEÆ.

Leaves opposite, not dotted . . . 36. RHIZOPHORACEÆ.

Leaves exstipulate; carpels combined. 40. LYTHRACEÆ.

Calyx superior or more or less adnate to the ovary.

Leaves exstipulate.

Style simple.

Connective of anthers without any appendage.

Leaves aromatic, gland-dotted. 38. MYRTACEÆ.

Leaves not aromatic, not dotted.

Ovary 1-celled; fruit angled or winged . . . 37. COMBRETACEÆ.

Ovary 1-4-celled; fruit not angled or winged . . . 44. CORNACEÆ.

Connective of anthers tubercled or spurred . . . 39. MELASTOMACEÆ.

Styles 2 or more.

Stamens usually 10³; ovules numerous in each cell . . . 35. SAXIFRAGACEÆ.

Stamens rarely more than 5; ovule solitary in each cell . . . 43. ARALIACEÆ.

Leaves minute or 0; succulent plants with jointed stems and branches, prickly . . . 42. CACTACEÆ.

¹ Calyx ultimately superior and adnate to the ovary in *Rosa*, *Pyrus*, *Crataegus* and *Cotoneaster* of Family ROSACEÆ.

² Carpels combined in *Pyrus*, *Crataegus* and *Cotoneaster* of Family ROSACEÆ.

³ Excepting *Itea* and *Ribes* which have 4-5 stamens.

A. ANGIOSPERMS.—

a. DICOTYLEDONS.—

ii. GAMOPETALÆ.

Ovary inferior or adnate to the calyx—Ser. 1. *EPIGYNÆ*.Ovary usually with more than 1 cell;
anthers not united.

Leaves opposite; stamens 4-5.

Leaves usually exstipulate . . . 45. CAPRIFOLIACEÆ.

Leaves always stipulate (unless
whorled) . . . 46. RUBIACEÆ.

Leaves alternate, (exstip.); stamens

8 or more . . . 53. STYRACEÆ.

Ovary 1-celled; anthers united . . . 47. COMPOSITÆ.

*Ovary superior or free.*¹—Ser. 2. *HYPOGYNÆ*.

Leaves alternate.

Stamens inserted on the receptacle.

Anthers opening at the apex . . . 48. ERICACEÆ.

Anthers opening inwards . . . 52. EBENACEÆ.

Stamens inserted on the corolla.

Ovules indefinite; inflorescence often
extra-axillary . . . 60. SOLANACEÆ.Ovules definite; inflorescence axil-
lary or terminal.

Leaves dotted; juice not milky . . . 50. MYRSINACEÆ.

Leaves not dotted.

Juice often milky.

Prostrate or climbing plants . . . 59. CONVULVULACEÆ.

Large erect shrubs or trees . . . 51. SAPOTACEÆ.

Juice not milky.

Ovary 2-or 4-celled; stamens

alternate with corolla-
lobes . . . 58. BORAGINACEÆ.

Ovary 1-celled; stamens

opposite to corolla lobes
or petals . . . 49. PLUMBAGINACEÆ.Leaves opposite².

Flowers regular; ovary of 2 carpels.

Stamens 2 . . . 54. OLEACEÆ.

Stamens 5. Juice generally milky.

¹ Ovary half-inferior in *Mossæ*. Family MYRSINACEÆ.² Leaves alternate in *Jasminum humile*, Family OLEACEÆ.

A. ANGIOSPERMS.—

a. DICOTYLEDONS.—

ii. GAMOPETALÆ—*contd.*

Filaments united into a tube,
anthers adnate to the stigma . . . 56. ASCLEPIADACEÆ.

Filaments free, anthers not adnate
to the stigma . . . 55. APOCYNACEÆ.

Stamens 4 or 5. Juice not milky . . . 57. LOGANIACEÆ.

Flowers irregular; ovary of 2 to 4
carpels.

Fruit elongated, seeds winged . . . 62. BIGNONIACEÆ.

Fruit not elongated, seeds not
winged.

Bracts conspicuous; stem with
swollen joints . . . 63. ACANTHACEÆ.

Bracts minute or absent; joints
of stem not swollen.

Ovule 1 or 2 in each cell.

Ovary entire, style terminal . . . 64. VERBENACEÆ.

Ovary 4-lobed, style gynobasic . . . 65. LABIATÆ.

Ovules many in each cell. . . 61. SCROPHULARIACEÆ.

A. ANGIOSPERMS.—

a. DICOTYLEDONS.—

iii. APETALÆ.

Flowers 2-sexual.¹

Ovary superior, 1-celled.

Stamens opening by valves. (Aromatic plants)

71. LAURACEÆ.

Stamens not opening by valves.

Leaves stipulate.

Stipules sheathing; perianth coloured; plants not aromatic

69. POLYGONACEÆ.

Stipules not sheathing; perianth usually 0; plants aromatic

70. PIPERACEÆ.

Leaves exstipulate.

Plant covered with silvery scales

74. ELÆAGNACEÆ.

Plants not as above.

Leaves opposite

66. NYCTAGINACEÆ.

Leaves alternate.²

Stamens twice as many as perianth lobes

73. THYMELEACEÆ.

Stamens as many as or fewer than perianth lobes.

Trees

72. PROTEACEÆ.

Herbs or shrubs.

Perianth scarious

67. AMARANTACEÆ.

Perianth green, herbaceous

68. CHENOPODIACEÆ.

Ovary inferior, 1-celled.

Plants parasitic on stems; ovule solitary, erect.

75. LORANTHACEÆ.
(*Loranthus*.)

Plants often parasitic on roots; ovules 2-5, pendulous

76. SANTALACEÆ.

Flowers 1-sexual.

Flowers not in catkins or spikes (except in *Morus*, URTICACEÆ).¹ Flowers 1-sexual and dioecious in *Piper*, Family PIPERACEÆ, and in *Litsea*, Family LAURACEÆ.² Leaves opposite in *Wikstroemia*, Family THYMELEACEÆ.

A. ANGIOSPERMS —

a. DICOTYLEDONS.—

iii. APETALÆ—*contd.*

Ovary 1-celled, 1-ovuled.

Leaves opposite and exstipulate,
or 0; ovary inferior. Para-
sitic plants75. LORANTHACEÆ.
(*Viscum.*)Leaves usually alternate, stipu-
late; ovary superior. Not
parasitic

78. URTICACEÆ.

Ovary 3-celled with 1 or 2 ovules in
each cell, superior

77. EUPHORBIACEÆ.

Male (sometimes also female) flowers
in catkins or spikes.Leaves simple, exstipulate; ovary
superior

80. MYRICACEÆ.

Leaves pinnate, exstipulate;
(flowers monœcious); ovary
inferior

79. JUGLANDACEÆ.

Leaves simple, stipulate.

Flowers dioecious; ovary su-
perior; seeds hairy

82. SALICACEÆ.

Flowers monœcious; ovary in-
ferior; seeds not hairy

81. CUPULIFERÆ.

A. ANGIOSPERMS.—

b. MONOCOTYLEDONS.

Flowers with a coloured perianth, solitary, umbelled or racemed; fruit a capsule or a berry—Sub-class i. PETALOIDEÆ.

Ovary inferior.

Flowers irregular, 2-sexual; leaves
with parallel venation 83. SCITAMINEÆ.

Flowers regular, 1-sexual; leaves with
reticulate venation 84. DIOSCOREACEÆ.

Ovary superior; flowers regular 85. LILIACEÆ.

*Flowers not coloured, arranged in a spadix; fruit a berry or a drupe.—
Sub-class ii. SPADICIFLORÆ.*

Perianth biserially 6-lobed; plants
usually woody 86. PALMÆ.

Perianth none or rudimentary; plants
herbaceous.

Inflorescence naked; leaves sessile,
linear 87. TYPHACEÆ.

Inflorescence inside a spathe; leaves
usually long-petioled and broad 88. ARACEÆ.

*Flowers glumaceous, arranged in spikelets; fruit a caryopsis.—Sub-
class iii. GLUMIFLORÆ.*

Sheath of leaf entire; stem 3-quetrous;
flower subtended by a single
glume 89. CYPERACEÆ.

Sheath of leaf usually split; stem terete;
flower subtended by several glumes. 90. GRAMINEÆ.

B. GYMNOSPERMS.—

Branches articulate; leaves opposite,
rudimentary or broad 91. GNETACEÆ.

Branches not articulate; leaves alter-
nate or fascicled, usually acicular
or linear 92. CONIFERÆ.

ANALYTICAL SYNOPSIS OF THE ORDERS AND FAMILIES.

1. PHANEROGAMS.

Plants representing the greatest morphological differentiation and generally the highest vegetative development, and producing *seeds*, as distinct from *spores*, for the purpose of reproduction.

A. ANGIOSPERMS.

Plants representing the highest evolution of the flower. *Anthers* borne normally on well-developed *filaments*. *Ovary* closed, crowned by a *stigma* which is in most cases borne by a *style*. *Fertilization* is effected by the pollen-tubes reaching the egg-cell of the ovule after penetrating the stigmatic tissue.

a. DICOTYLEDONS.

Plants with roots which usually branch from the prolongation of the radicle; wood and bark separated by a cambium layer. *Leaves* reticulately veined. *Flowers* usually 4-or 5-merous. *Embryo with two cotyledons*.

i. POLYPETALÆ.

Flowers with both *calyx* and *corolla*, the latter *of distinct petals*.

14 SYNOPSIS OF THE ORDERS AND FAMILIES.

1. THALAMIFLORÆ.

Torus not expanded. Flowers generally regular. *Calyx* inferior, usually of distinct *sepals*. *Corolla* hypogynous, usually of distinct *petals*. *Stamens* hypogynous. *Ovary* superior.

Order 1. **Ranales.**

Flowers usually regular, sometimes apetalous. *Stamens* generally indefinite. *Ovary* apocarpous. *Seeds* albuminous.

1. **Ranunculaceæ.** Generally erect herbs (rarely climbing shrubs). *Sepals* deciduous, often petaloid. *Petals* sometimes wanting. *Stamens* indefinite. *Carpels* numerous, usually free.

2. **Dilleniaceæ.** Usually trees or shrubs. *Leaves* alternate, simple, exstipulate. *Sepals* 5, fleshy, imbricate: persistent. *Petals* 5, caducous. *Stamens* indefinite, in many series. *Seeds* usually arillate.

3. **Magnoliaceæ.** Trees or shrubs. *Leaves* alternate, simple, generally with convolute deciduous stipules. *Sepals* and *petals* alike, in whorls of three, imbricate, deciduous. *Stamens* indefinite, free or monadelphous. *Carpels* numerous, usually on an elongated torus. *Albumen* uniform.

4. **Anonaceæ.** Trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* 3-merous. *Sepals* 3, valvate. *Petals* fleshy, valvate, usually in two 3-merous series. *Stamens* usually indefinite. *Albumen* ruminated.

5. **Menispermaceæ.** Generally climbing shrubs. *Leaves* alternate, exstipulate. *Flowers* trimerous, small, usually 1-sexual and dioecious. *Stamens* generally 6 in two series, opposite to the petals. *Carpels* usually 3; style usually lateral in fruit. *Seed* crescent-shaped. *Albumen* even or ruminated.

6. **Berberidaceæ.** *Leaves* alternate or fascicled, glabrous. *Sepals* and *petals* alike, generally 3-merous, caducous. *Stamens* opposite to the petals; anthers opening usually by valves. *Fruit* usually of one carpel. *Seeds* not curved.

Order 2. **Parietales.**

Leaves usually alternate. *Flowers* with both *sepals* and *petals*. *Ovary* syncarpous, 1-2-or more-celled; ovules numerous. *Placentation* parietal.

7. **Capparidaceæ.** *Flowers* 4-merous, often irregular. *Stamens* 4-8, or numerous. *Ovary* 1-celled, usually long-stipitate. *Seeds* exalbuminous.

8. **Bixaceæ.** *Leaves* simple. *Flowers* regular, sometimes unisexual. *Sepals* 4-5. *Petals* 4-5, or 0. *Stamens* numerous. *Ovary* normally 1-celled. *Seeds* albuminous.

Order 3. **Floygales.**

Leaves alternate, simple, entire. *Calyx* and *Corolla* both present. *Stamens* not indefinite. *Ovary* syncarpous. *Placentation* usually axile.

9. **Pittosporaceæ.** Shrubs or small trees. *Leaves* simple entire, exstipulate. *Flowers* regular, 5-merous. *Stamens* 5, alternating with the petals. *Ovary* normally 1-celled. *Fruit* a 2-valved capsule. *Seeds* albuminous.

Order 4. **Caryophyllales.**

Leaves simple, opposite or alternate. *Flowers* generally 5-merous. *Calyx* often gamosepalous. *Stamens* usually definite. *Ovary* 1-celled. *Placenta* central, ultimately free. *Seeds* usually albuminous.

10. **Tamaricaceae.** Shrubs or small trees. *Leaves* alternate, reduced to minute scales. *Flowers* regular, generally 5-merous. *Sepals* and *petals* imbricate, free or connate below. *Stamens* 5 or 10, rarely 4 or 8; anthers versatile. *Fruit* a capsule. *Seeds* hairy or winged.

Order 5. **Guttiferales.**

Generally erect shrubs or trees. *Leaves* simple. *Flowers* regular 2-sexual, generally 5-merous. *Calyx* imbricate. *Stamens* usually indefinite. *Ovary* syncarpous. *Placenta* axile. *Seeds* exalbuminous.

11. **Hypericaceae.** Erect shrubs. *Leaves* opposite, exstipulate, generally gland-dotted. *Sepals* and *petals* 5. *Stamens* indefinite, 3-5-adelphous. *Fruit* a capsule. *Seeds* numerous.

12. **Ternstroemiaceae.** Shrubs, rarely climbing, or trees. *Leaves* alternate, exstipulate. *Sepals* 5, imbricate. *Petals* 5, often more or less united at the base. *Filaments* often connate or adnate to the base of the corolla. *Ovary* 3-5-celled.

13. **Dipterocarpaceae.** Resinous trees. *Leaves* alternate; stipules generally inconspicuous and early caducous. *Sepals* 5, connate in flower, persistent, 2 or more accrescent in fruit. *Petals* 5, twisted. *Stamens* numerous (in *Shorea*); anthers with an aristate connective. *Fruit* indehiscent, 1-seeded, generally winged with enlarged calyx-lobes. *Cotyledons* fleshy.

Order 6. **Malvales.**

Usually erect shrubs or herbs, or trees, with mucilaginous and fibrous bark. *Leaves* alternate, simple, palmately lobed or digitate, stipulate, usually stellately hirsute. *Flowers* regular, generally 2-sexual, often bracteate. *Sepals* 5, valvate. *Petals* 5, rarely 4. *Stamens* usually many. *Ovary* generally syncarpous, sometimes stipitate. *Albumen* scanty or 0.

14. **Malvaceae.** Young parts usually stellate-hairy. *Flowers* supported by bracteoles which generally form an epicalyx. *Petals* twistedly imbricate. *Stamens* 1-adelphous, rarely 5-adelphous; anthers 1-celled. *Carpels* usually many; styles more or less connate.

15. **Sterculiaceae.** Young parts more or less pubescent. *Flowers* sometimes 1-sexual. *Sepals* 5, valvate, more or less connate. *Petals* 5, connate at the base or 0. *Filaments* monadelphous with 5-many 2-celled extrorse anthers. *Ovary* stipitate or sessile, syncarpous or apocarpous. *Fruit* a capsule or of distinct follicles.

16. **Liaceae.** *Sepals* 3-5, free or connate, valvate. *Petals* 3-5, usually free, rarely absent. *Stamens* indefinite, distinct; anthers 2-celled, introrse. *Ovary* free, 2-10-celled. *Fruit* a drupe or a capsule.

2. DISCIFLORÆ.

Torus generally expanded into a fleshy disk between the petals and the ovary. Sepals distinct or connate, generally small. *Petals* distinct or more or less coherent at the base or at the apex (as in some VITACEÆ), inserted on or outside the hypogynous disk. *Ovary* superior.

Order 1. Geraniales.

Flowers usually 5-merous. *Stamens* generally twice the number of petals. *Disk* sometimes wanting. *Ovules* 1 or 2 in each cell, pendulous; raphe ventral.

* *Leaves* simple, generally stipulate. *Flowers* regular or irregular.

17. **Linaceæ.** *Leaves* alternate, usually entire. *Flowers* regular, 2-sexual. *Sepals* entire, imbricate. *Petals* contorted in bud, each with a gland at the base, representing the disk. *Stamens* 5 and alternating with as many staminodes, or 10, adnate to the glands of the disk; anthers versatile. *Ovary* 3-5-celled; styles 3-5. *Fruit* a capsule. *Seeds* often albuminous.

18. **Malpighiaceæ.** Usually climbing shrubs. *Leaves* opposite, generally exstipulate. *Flowers* 2-sexual, often irregular. *Calyx* 5-partite, usually with a large gland outside. *Petals* 5, imbricate. *Disk* obscure. *Ovary* 3-celled; styles 1-3. *Fruit* of 1-3 samaras. *Seeds* exalbuminous.

** *Leaves* pinnately compound, generally exstipulate. *Flowers* regular.

19. **Rutaceæ.** *Leaves* usually alternate, pellucid-punctate. *Calyx* small, 4-5 imbricate lobes. *Petals* 4-5, generally imbricate. *Stamens* up to 10, rarely more. *Disk* annular or cylindrical, within the stamens. *Ovary* of 4-5 free or connate carpels; styles 1-5. *Fruit* various.

20. **Simarubaceæ.** Trees or erect shrubs with bitter bark. *Leaves* alternate. *Flowers* usually 1-sexual. *Calyx* small, 3-5 lobed. *Petals* valvate or imbricate. *Stamens* up to 10, inserted at the base of the disk. *Ovary* often deeply lobed. *Fruit* drupaceous or samaroid. *Seeds* usually albuminous.

21. **Burseraceæ.** Resinous trees or erect shrubs. *Leaves* alternate. *Flowers* 2-sexual or polygamous. *Calyx* 3-7-lobed, often minute. *Petals* 3-7, imbricate or valvate. *Disk* annular or cupular. *Stamens* up to 10, inserted at the base or on the margin of the disk. *Ovary* 2-5-celled; style simple. *Fruit* a drupe. *Seeds* exalbuminous.

22. **Meliaceæ.** Mostly trees. *Leaves* alternate. *Flowers* generally 2-sexual. *Calyx* 3-6-lobed. *Petals* 3-6, generally imbricate. *Stamens* up to 12; filaments usually connate into a tube. *Disk* hypogynous, inside the staminal tube. *Ovary* 2-5-celled; style single. *Fruit* various. *Seeds* albuminous in the local species.

Order 2. Olacales.

Leaves simple, usually alternate; stipules 0 or inconspicuous. *Flowers* regular, often 1-sexual, usually 5-merous. *Calyx* generally persistent. *Filaments* more or less connate, often adnate to the

petals. *Disk* sometimes wanting. *Style* simple or 0. *Ovules* pendulous; raphe dorsal. *Fruit* drupaceous. *Seeds* albuminous.

23. **Olcaceae.** *Leaves* exstipulate. *Petals* valvate. *Disk* cup-shaped. *Fertile stamens* 3-5. *Ovary* spuriously 3-5-celled; placenta central. *Fruit* 1-celled, 1-seeded.

24. **Illicaceae.** *Leaves* alternate; stipules minute and caducous. *Flowers* usually 1-sexual, often dioecious; sepals and petals more or less connate at the base. *Filaments* subulate, generally free in the female or 2-sexual flowers, adnate to the base of the corolla in male flowers. *Disk* 0. *Style* short or 0. *Fruit* a drupe with 2 or more stones.

Order 3. Celastrales.

Trees or shrubs. *Leaves* mostly simple, stipulate. *Flowers* regular, 4-5-merous, cymose. *Stamens* as many as petals. *Disk* conspicuous. *Ovary* 2-6-celled, sometimes sunk in the disk; style simple, rarely 0. *Ovules* erect; raphe ventral. *Seeds* usually albuminous.

25. **Celastraceae.** *Leaves* opposite or alternate. *Flowers* 2-sexual or polygamous. *Calyx* imbricate, persistent. *Petals* imbricate, often 0. *Stamens* alternating with the petals or (if petals 0) opposite to the calyx-lobes. *Ovules* usually 2 in each cell. *Seeds* mostly arillate, sometimes winged.

26. **Rhamnaceae.** *Leaves* generally alternate; stipules sometimes turned into prickles. *Flowers* small, greenish or pale. *Calyx* sometimes superior; lobes valvate, triangular. *Petals* generally involute, usually shorter than the calyx-lobes, sometimes 0. *Disk* fleshy. *Stamens* opposite to the petals or (when petals 0) alternating with the calyx-lobes; anthers versatile. *Ovary* usually 3-celled, with 1 ovule in each cell.

27. **Vitaceae.** Mostly cirrhose climbing shrubs. *Leaves* alternate, simple or variously compound. *Flowers* usually 2-sexual. *Calyx-lobes* and petals valvate, the latter often cohering and caducous. *Disk* fleshy. *Stamens* opposite to the petals; filaments subulate; anthers introrse. *Style* short or 0. *Ovules* 1-2 in each cell. *Fruit* a berry.

Order 4. Sapindales.

Generally erect shrubs or trees. *Leaves* alternate (except in *Acer*, *Staphylea* and *Coriaria*) and exstipulate (except in *Staphylea*). *Flowers* regular or irregular, sometimes 1-sexual. *Calyx-lobes* imbricate. *Petals* free. *Stamens* free, generally some wanting or barren. *Disk* present (except in *Coriaria*). *Ovules* ascending or pendulous from an erect funicle; raphe ventral. *Seeds* generally exalbuminous.

28. **Sapindaceae.** *Flowers* often irregular. *Petals* 4-5, sometimes 0. *Disk* complete or one-sided. *Stamens* hypogynous, generally 8. *Ovary* generally 3-celled, sometimes eccentric; style usually terminal. *Seeds* sometimes arillate, usually with a large hilum.

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29. **Sabiaceae.** *Flowers* generally small, usually 2-sexual. *Petals* often unequal. *Disk* small, annular. *Stamens* opposite to the petals; sometimes unequal and then only 2 or 3 perfect. *Seeds* with a broad hilum, sometimes compressed.

30. **Anacardiaceae.** *Trees* or shrubs, usually resinous. *Flowers* regular, small. *Petals* free. *Disk* annular. *Stamens* sometimes not all perfect. *Ovary* 1-celled. *Fruit* usually a 1-seeded drupe.

31. **Coriariaceae.** *Erect* shrubs with quadrangular branches. *Leaves* opposite or whorled, simple. *Flowers* regular, 2-sexual. *Sepals* 5, spreading. *Petals* 5, keeled, accrescent in fruit. *Disk* 0. *Stamens* 10; anthers exserted. *Carpels* usually 5, free, embraced by the fleshy petals.

32. **Moringaceae.** *Trees* with soft wood. *Leaves* 2- or 3-pinnate, glandular at the base. *Flowers* irregular, 2-sexual. *Calyx* petaloid, segments deciduous. *Petals* 5, unequal. *Disk* lining the calyx-tube. *Stamens* on the edge of the disk, declinate, 5 fertile and opposite to the petals alternating with 5 antherless filaments. *Ovary* stalked, 1-celled; ovules on 3 parietal placentas. *Fruit* a pod-like 8-angled, loculicidal capsule. *Seeds* usually winged.

3. CALYCIFLORÆ.

Calyx gamosepalous. Disk thin, often lining the calyx-tube. Petals and stamens inserted on the calyx or on the disk when it is adnate to the calyx. Ovary superior or inferior.

Order 1. **Fosales.**

Leaves generally alternate, stipulate (*Leguminosae* and *Rosaceae*) or exstipulate (*Saxifragaceae*, etc.). *Ovary* of one or more free or connate carpels; styles usually as many as carpels. *Seeds* generally exalbuminous in the first two Families, albuminous in the others.

33. **Leguminosae.** *Leaves* alternate; stipulate, usually compound. *Flowers* 2-sexual, generally irregular. *Calyx* often 2-lipped with the odd lobe inferior. *Petals* normally 5, usually free, sometimes very unequal. *Stamens* normally 10 and declinate, or numerous and straight. *Ovary* quite free, 1-celled; ovules one or more on the ventral suture. *Fruit* a 1-many-seeded pod. *Seeds* exalbuminous except in some *Casalpiniæ*.

34. **Rosaceae.** *Leaves* alternate, stipulate, simple or compound. *Flowers* regular, usually 2-sexual. *Calyx* with the odd lobe superior. *Stamens* many, distinct. *Ovary* of 1 or more free or connate carpels; ovules not more than 2 in each carpel. *Fruit* various, but never a pod or a berry, usually 1-seeded.

35. **Saxifragaceae.** *Herbs* or shrubs. *Leaves* opposite or alternate, simple, exstipulate. *Flowers* regular, generally 2-sexual. *Calyx* more or less adnate to the ovary. *Petals* 5, rarely 4 or 0. *Stamens* 5, or 10, or numerous. *Ovary* 2-5-celled; styles as many as the carpels. *Fruit* a berry or a capsule. *Seeds* many, albuminous.

Order 2. **Myrtales.**

Leaves simple, generally exstipulate. *Flowers* regular, usually 2-sexual. *Stamens* at least twice the number of petals. *Ovary*

generally inferior; style 1; ovules as a rule pendulous. *Seeds* exalbuminous (in the local Families).

36. **Rhizophoraceae.** *Leaves* opposite, with caducous stipules. *Flowers* 2-sexual. *Calyx* 4-14-toothed. *Petals* as many as the calyx-teeth. *Stamens* 2-4-times the number of petals. *Ovary* 5-1-celled; ovules 2 in each cell, pendulous. *Fruit* 1-celled, 1-seeded.

37. **Combretaceae.** *Leaves* opposite or alternate, exstipulate. *Flowers* rarely 1-sexual. *Calyx*-lobes 4-5, valvate. *Petals* 4-5 or 0. *Stamens* as many or twice as many as the petals. *Ovary* 1-celled; ovules pendulous. *Fruit* usually a 1-seeded drupe.

38. **Myrtaceae.** *Leaves* typically opposite and then gland-dotted. *Calyx*-limb short, 4-5-toothed or entire. *Petals* generally 4, free or united in a calyptra. *Stamens* indefinite; anthers often versatile. *Ovary* 1-many-celled, with one, few or many ovules. *Seeds* generally angular.

39. **Melastomaceae.** *Leaves* opposite or whorled, entire, 3-7-nerved from the base. *Flowers* generally showy; 2-sexual. *Calyx*-tube constricted above, limb 3-5-lobed. *Petals* 3-5, twisted in bud. *Stamens* 4-10; anthers usually opening by pores; connective tubercled or spurred. *Ovary* 3-5-celled; ovules many; style simple. *Fruit* a many-seeded capsule.

40. **Lythraceae.** *Leaves* entire, generally opposite, exstipulate. *Flowers* 2-sexual. *Calyx* inferior (except in *Punica*), lobes 3-6; valvate. *Petals* as many as calyx-lobes or 0. *Stamens* definite or indefinite. *Ovary* superior (except in *Punica*); style simple, persistent; ovules many on an axile placenta. *Fruit* a capsule; seeds numerous.

Order 3. **Passiflorales.**

Mostly herbaceous plants. *Leaves* alternate, simple, often lobed, stipulate. *Flowers* regular, 2-sexual or 1-sexual, showy except in *Samydaceae*. *Ovary* superior or inferior, 1-3-celled, exceptionally 5-celled; style single or 2-4; placentas parietal. *Fruit* 1-celled. *Seeds* generally arillate, usually albuminous.

41. **Samydaceae.** Generally trees. *Leaves* often punctate. *Flowers* small. *Calyx* inferior, 4-5-lobed. *Petals* generally 0. *Stamens* definite or indefinite, usually united into a hypogynous tube. *Ovary* superior, 1-celled; style single; placentas 3. *Fruit* a capsule. *Seeds* arillate and albuminous.

Order 4. **Ficoidales.**

Succulent plants of xerophytic habit. *Leaves* alternate or opposite, often reduced or 0. *Flowers* usually 2-sexual, regular to sub-regular. *Ovary* syncarpous, inferior to superior, 1-celled with parietal or 2-many-celled with axile placentæ. *Fruit* a berry or a capsule.

42. **Cactaceae.** Stem and branches jointed, succulent, prickly. *Leaves* minute or 0. *Flowers* 2-sexual, showy. Sepals and petals similar, numerous, free or united into a tube. *Stamen* indefinite; anthers minute. *Ovary* 1-celled, adnate to the calyx-tube or inferior. *Fruit* a berry. *Seeds* numerous.

Order 5. **Umbellales.**

Leaves mostly alternate, simple or compound, usually exstipulate. *Flowers* regular, usually 2-sexual, often in heads or umbels. *Calyx-tube* adnate to the ovary. *Petals* 5, rarely more or 0, generally valvate. *Disk* epigynous, conspicuous. *Ovary* inferior, generally 2-celled, with one ovule in each cell; style solitary or as many as the cells. *Fruit* various. *Seeds* pendulous, albuminous.

43. **Araliaceae.** *Petioles* long, usually clasping the stem; stipules adnate to the petiole or 0. *Flowers* small, 2-sexual or polygamous. *Calyx-lobes* short, truncate or with small teeth. *Petals* usually 5, normally valvate, deciduous. *Stamens* as many as the petals, inserted on the disk; anthers versatile. *Ovary* 2-5-celled; style as many as the cells. *Fruit* a drupe or a berry.

44. **Cornaceae.** Shrubs or trees. *Leaves* simple, opposite or alternate, entire. *Flowers* in heads, cymes or panicles. *Calyx-lobes* truncate or with small teeth. *Petals* 4-5, valvate, or none. *Stamens* generally as many as the petals, rarely more. *Ovary* 1-4-celled; style single. *Fruit* usually a succulent drupe.

ii. GAMOPETALÆ.

Flowers usually 2-sexual. *Calyx* and *corolla* both present, the latter with the petals more or less connate, rarely completely free. *Stamens* usually inserted on the corolla.

Series i. EPIGYNÆ.

Stamens epipetalous, alternating with the corolla-lobes. *Ovary* inferior.

Order 1. **Rubiales.**

Leaves simple, opposite or whorled. *Flowers* 4-5-merous, generally regular, 2-sexual. *Calyx* incised. *Corolla-tube* generally not short. *Ovary* 2-8-celled; style simple; ovules pendulous. *Seeds* albuminous.

45. **Caprifoliaceae.** *Leaves* as a rule exstipulate. *Flowers* 5-merous, bracteate, in corymbose or panicle cymes, sometimes in pairs; aestivation imbricate. *Stamens* inserted on the corolla-tube between the lobes; anthers versatile. *Ovary* 1-6-celled; ovules solitary and pendulous or many on axile placentas.

46. **Rubiaceae.** *Leaves* opposite and with interpetiolar stipules, or whorled. *Flowers* 4-5-merous, regular. *Corolla* tubular or rotate, lobes sometimes valvate. *Stamens* 4-5, inserted on the corolla-tube and alternating with the corolla-lobes. *Ovary* generally 2-celled, less often 3-5-celled, rarely 1-celled; ovules anatropous, 1 or more in each cell.

Order 2. **Asterales.**

Mostly herbs. *Leaves* opposite or alternate, generally exstipulate. *Flowers* usually sessile. *Calyx* generally inconspicuous. *Corolla*

regular or irregular. *Stamens* on the corolla-tube. *Ovary* usually 1-celled, 1-ovuled. *Seeds* erect and exalbuminous in *Compositae*, pendulous and often albuminous in other Orders.

47. Compositae. Herbs or shrubs. *Leaves* generally alternate, exstipulate. *Flowers* sessile in heads. *Calyx-limb* represented by hairs or scales or absent, *Corolla-lobes* 5 and valvate in disk-flowers, ligulate in ray-flowers. *Disk* epigynous. *Stamens* 4-5, on the corolla-tube; filaments usually free; anthers usually syngenesious. *Ovary* 1-celled, with one erect ovule; style slender, 2-fid. *Fruit* a cypsel. *Seeds* exalbuminous.

Series ii. HYPOGYNÆ.

Stamens epipetalous, or free and hypogynous, 4-5 or more. *Ovary* superior.

* *Carpels* more than two. (*Leaves* simple, generally exstipulate. *Flowers* regular.)

Order 3. Ericales.

Leaves alternate, exstipulate. *Flowers* regular. *Stamens* usually hypogynous, often twice the number of corolla-lobes; filaments free. *Fruit* generally a capsule. *Seeds* many, albuminous.

48. Ericaceae. *Flowers* solitary, fascicled or racemed. *Calyx* free, usually 5-lobed. *Corolla* campanulate or urceolate. *Stamens* generally twice as many as the corolla-lobes; anthers usually opening at top by pores or slits. *Ovary* 4-5-many-celled; ovules many. *Seeds* small.

Order 4. Primulales.

Leaves generally alternate, exstipulate. *Corolla-tube* generally short, or petals almost free. *Stamens* usually on the corolla-tube, always opposite to the lobes. *Style* solitary (except in PLUMBAGINÆ). *Ovary* 1-celled; placentation free-central. *Seeds* usually albuminous.

49. Plumbaginaceae. Shrubs or undershrubs. *Leaves* alternate, exstipulate. *Flowers* regular, 2-sexual. *Calyx* gamosepalous, more or less tubular, persistent inferior. *Corolla* salver-shaped, 5-lobed or of 6 free petals. *Stamens* 5, opposite to the corolla-lobes or petals, and adnate to their base. *Ovary* 1-celled. *Ovule* 1. *Fruit* dry, included in the calyx.

50. Myrsinaceae. *Leaves* alternate, gland-dotted. *Flowers* small, inflorescence generally axile. *Calyx* sometimes adnate to the ovary; lobes persistent. *Petals* nearly or completely free. *Anthers* free or united by their margins. *Fruit* a berry. *Seeds* generally solitary and excavate at the base.

Order 5. **Ebenales.**

Trees or shrubs. *Leaves* alternate, exstipulate. *Flowers* usually 4-merous. *Calyx* generally persistent. *Corolla-tube* short. *Stamens* epipetalous, as many as the corolla-lobes and opposite to them or 2-3 times as many, in several series, sometimes indefinite. *Ovary* 2-8-celled; ovules 1 or 2 in each cell, generally pendulous. *Fruit* a drupe or a berry. *Seeds* generally albuminous.

51. **Sapotaceae.** Young parts rusty-tomentose; juice often milky. *Leaves* entire, exceptionally with caducous stipules. *Calyx-lobes* 4-8, the outer whorl valvate. *Corolla-lobes* 2-24, in two series if more than 14. *Stamens* as many as the corolla-lobes or numerous in several series; filaments short; anthers extrorse with the connective often produced. *Ovary* usually 6-8-celled, with a solitary anatropous ovule in each cell; style simple. *Fruit* a berry. *Seeds* generally albuminous (exalbuminous in *Bassia*).

52. **Ebenaceae.** *Leaves* exceptionally sub-opposite, entire. *Flowers* dioecious rarely polygamous. *Calyx* often accrescent. *Corolla-lobes* generally twisted. **MALE** Fls.: *stamens* 4-16; anthers narrow. **FEM.** Fls.: *staminodes* 2-10, or 0. *Ovary* 2-more-celled; ovule generally solitary, anatropous; styles 2-8. *Fruit* a berry, 1-10-seeded. *Seeds* with copious albumen.

53. **Styracaceae.** *Leaves* alternate, usually serrate or crenate. *Flowers* 2-sexual, generally white. *Calyx* adnate to the ovary; limb persistent. *Corolla* of 4-5 almost free petals. *Stamens* usually indefinite, attached to the corolla-tube or base of the petals in one or several series. *Ovary* half-superior, 2-5-celled; ovules usually 2 in each cell, pendulous (in *Symplocos*). *Fruit* drupaceous. *Seeds* albuminous.

** *Carpels* never exceeding two. (*Leaves* as a rule exstipulate.)

A. *Flowers* regular. *Stamens* 2 or 5, rarely 4.

Order 6. **Gctinanales.**

Leaves normally opposite if not whorled. *Flowers* usually 2-sexual. *Stamens* between the corolla lobes. *Carpels* distinct or connate; style generally simple.

54. **Oleaceae.** *Leaves* simple, 3-foliate or imparipinnate. *Calyx* 4-5 or more-toothed, or truncate. *Corolla-lobes* 4-5 or more. *Stamens* 2, on the corolla-tube or hypogynous; filaments generally short. *Ovary-cells* 1-2-ovuled; style simple; stigma simple or 2-lobed. *Fruit* a capsule, berry or drupe, 2-celled with 1 or 2 seeds in each cell. *Seeds* albuminous or exalbuminous.

55. **Apocynaceae.** Trees or shrubs with milky juice. *Leaves* opposite or whorled, very rarely alternate, simple, quite entire. *Calyx-lobes* 5, generally imbricate. *Corolla* rotate or salver-shaped; lobes twistedly imbricate. *Stamens* 5, on the corolla-tube, sometimes adherent to the stigma by the connectives; anthers sometimes spurred downwards; pollen granular. *Ovary* of 2 distinct or connate carpels. *Fruit* of 2 distinct or connate follicles, or a drupe, or a berry. *Seeds* usually albuminous, those of follicular fruits usually comose or winged.

56. **Asclepiadaceae.** Herbs or shrubs with milky juice. *Leaves* opposite, simple, entire, sometimes 0. *Calyx-lobes* 5, imbricate. *Corolla-tube* short, often with a ring of scales at the mouth; lobes valvate or imbricate. *Stamens* 5

rarely free generally connate into a fleshy column with the anthers adhering to the stigma by broad connectives; pollen in 1 or 2 granular or waxy masses in each cell at the angles of the stigma. *Styles* 2, connate; stigma 5-angled. *Fruit* normally of 2 follicles. *Seeds* comose at the hilum, albuminous.

57. **Loganiaceae.** Trees, shrubs or herbs. *Leaves* opposite, simple; stipules obsolete. *Flowers* 4-5-merous. *Stamens* on the corolla-tube; filaments distinct. *Ovules* usually many in each cell; style simple. *Fruit* a berry or a capsule, 1-many-seeded. *Seeds* albuminous.

Order 7. Polemoniales.

Leaves usually alternate, simple, exstipulate. *Flowers* 5-merous, usually 2-sexual, generally cymose, often showy. *Calyx* generally persistent, often accrescent. *Stamens* 5, on the corolla-tube, alternating with the corolla-lobes. *Style* generally simple, terminal or gynobasic.

58. **Boraginaceae.** Herbs, shrubs or trees. *Leaves* alternate, sometimes subopposite or opposite. *Calyx-lobes* valvate. *Ovary* sometimes spuriously 4-celled; ovules usually 4 together; style simple or forked, terminal or gynobasic. *Fruit* a drupe or of 2-4 nutlets. *Seeds* erect or oblique.

59. **Convulvaceae.** Herbs or shrubs, usually twining. *Leaves* alternate rarely 0. *Flowers* 2-sexual. *Calyx-lobes* imbricate. *Corolla* campanulate or funnel-shaped, often 5-plated in bud. *Ovary* sometimes spuriously 4-celled; ovules 2 in each carpel. *Style* usually simple. *Seeds* generally exalbuminous; cotyledons plaited or 0 (as in *Cuscuta*).

60. **Solanaceae.** Herbs or shrubs. *Leaves* alternate. *Flowers* solitary or in cymes, axillary, extra-axillary or terminal. *Corolla* rotate or campanulate, often plaited in bud. *Ovules* many on large peltate placentas. *Style* simple. *Fruit* a many-seeded berry or a capsule. *Seeds* albuminous; embryo curved.

B. Flowers irregular. Stamens usually 4 (by the suppression of the odd one), often 2 long and 2 short, or only 2. Leaves usually opposite.

Order 8. Personales.

Flowers usually 2-sexual. *Corolla* generally 2-labiate with the neck of the tube more or less constricted. *Stamens* epipetalous, 4 with the posterior one abortive, or 2. *Carpels* 2, median; ovules generally indefinite; style simple. *Fruit* capsular. *Seeds* without albumen.

61. **Scrophulariaceae.** Herbs, rarely shrubs or trees. *Leaves* simple, usually opposite, sometimes whorled; stipules 0. *Flowers* usually 2-sexual, zygomorphic, pentamerous. *Calyx* inferior. *Corolla* more or less 2-lipped. *Stamens* 4, didynamous, sometimes with a rudimentary 5th. *Ovary* 2-celled, superior. *Ovules* many. *Fruit* a capsule. *Seeds* as a rule many.

62. **Bignoniaceae.** Usually trees. *Leaves* pinnately compound. *Flowers* generally in terminal panicles or racemes. *Calyx* truncate or spathaceous; lobes valvate. *Corolla* unequally 5-lobed, imbricate in bud. *Stamens* usually 4 and didynamous, rarely 5 and nearly equal. *Ovary* more or less stipitate and supported by an annular disk. *Fruit* an elongated capsule. *Seeds* winged.

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63. **Acanthaceae.** Usually shrubs or herbs with swollen joints. *Leaves* opposite, usually simple. *Flowers* bracteate and bracteolate. *Calyx* usually 5-partite. *Corolla* 2-lipped or subequally 5-lobed; lobes imbricate or twisted. *Stamens* 4 or 2. *Ovules* 1 or more, superposed in each cell of the ovary; style 2-rid with one arm usually sterile. *Fruit* a loculicidal capsule. *Seeds* compressed, usually hairy.

Order 9. Lamiales.

Stem more or less quadrangular. *Leaves* opposite and decussate. *Flowers* 5-merous, usually 2-labiate and didynamous. *Stamens* epipetalous. *Carpels* 2, median. *Ovary* 2- or falsely 4-celled. *Fruit* with 1-4 seeds.

64. **Verbenaceae.** Herbs, shrubs or trees. *Leaves* simple or digitate. *Flowers* cymose and bracteate, rarely regular. *Calyx* 4-5-toothed, often persistent and accrescent, sometimes coloured. *Corolla* 2-lipped or more or less equally lobed. *Stamens* usually 4, one pair longer than the other in 2-labiate flowers, more or less equal in regular flowers. *Ovary* 2-4-celled, entire; style terminal. *Fruit* usually a drupe, rarely a capsule. *Seeds* exalbuminous.

65. **Labiatae.** Mostly herbs, rarely shrubs, glandular-hairy and more or less aromatic. *Flowers* always 2-labiate, in verticelled cymes which are arranged in simple or panicle spikes. *Calyx* persistent. *Stamens* 4, one pair longer than the other. *Disk* prominent. *Ovary* 4-lobed, 4-celled; style gynobasic. *Fruit* of 4 1-seeded nutlets.

iii. APETALAE.

Perianth single and generally calycine, rarely double or none. *Flowers* in many cases unisexual.

Series 1. — *Flowers* usually 2-sexual and generally regular. *Ovary* as a rule 1-celled and 1-ovuled. *Leaves* simple, generally entire.

* *Ovary superior.*

A. Generally herbaceous. *Perianth* regular, green or coloured. *Style* in most cases solitary. *Fruit* as a rule nut-like. *Embryo* curved.

66. **Nyctaginaceae.** Herbs or shrubs sometimes scandent. *Leaves* usually opposite, exstipulate. *Flowers* bisexual, regular. *Bracts* often large and coloured. *Perianth* gamophyllous, petaloid, persistent. *Stamens* typically 5, alternate with the perianth but often less or more. *Ovary* 1-celled, superior. *Ovule* 1, basal. *Fruit* indehiscent, enclosed in the persistent perianth tube.

67. **Amarantaceae.** *Leaves* generally alternate, exstipulate. *Flowers* bracteate and bracteolate. *Perianth* scarious, persistent. *Stamens* up to 5, opposite the sepals. *Fruit* usually a utricle (although baccate in two species described in this Flora). *Seed* albuminous.

68. **Chenopodiaceae.** Mostly herbs. *Leaves* alternate, rarely opposite, simple, exstipulate. *Flowers* small, inconspicuous. *Perianth* sepaloid, persistent; segments 3-5, imbricate. *Stamens* as many as and opposite the perianth-segments. *Ovary* 1-celled, free. *Ovule* 1, basal. *Fruit* usually a small utricle, enclosed in the persistent perianth.

69. **Polygonaceae.** Herbs or shrubs. *Leaves* alternate; *stipules* mostly membranous and sheathing. *Flowers* 2-sexual. *Perianth*-segments 3-6, persistent, imbricate. *Stamens* usually 5-8, opposite the perianth-segments. *Ovary* free, 1-celled, 2-3-gonous. *Ovule* 1. *Fruit* a nut, usually enclosed in the sometimes accrescent perianth.

B. Aromatic herbs or shrubs. *Flowers* usually without a perianth, bracteate, arranged in a spike or a spadix. *Ovule* orthotropous. *Embryo* minute, not curved, imbedded in copious albumen.

70. **Piperaceae.** *Leaves* entire, often punctate. *Flowers* supported by peltate bracts in catkin-like spikes. *Fruit* small.

C. *Leaves* usually alternate, entire, exstipulate. *Flowers* regular, mostly 2-sexual, 3-4-5-merous. *Stamens* typically in two whorls, perigynous. *Ovule* anatropous. *Embryo* straight.

71. **Lauraceae.** Aromatic plants. *Perianth* usually 3-merous, often persistent; segments imbricate. *Stamens* perigynous, up to 12 in 3 or 4 series, the innermost series often reduced to staminodes; filaments often with 2 glands at the base; anther-cells opening by deciduous valves. *Ovule* pendulous. *Seeds* pendulous, exalbuminous.

72. **Proteaceae.** Trees. *Leaves* mostly alternate, evergreen, exstipulate. *Flowers* in racemes, bisexual. *Perianth* gamophyllous, petaloid, tubular; lobes 4, valvate. *Stamens* 4, filaments inserted on perianth-segments. *Ovary* free, 1-celled. *Seeds* few.

73. **Thymelaeaceae.** Shrubs or trees with very fine tenacious bast. *Leaves* alternate or opposite. *Flowers* 2-sexual; perianth tubular or campanulate; lobes usually 4, imbricate. *Stamens* epiphyllous, usually twice as many as the corolla-lobes and then in 2 series one above the other. *Style* long or short or 0. *Ovule* pendulous. *Fruit* usually indehiscent. *Seeds* generally exalbuminous.

74. **Elaeagnaceae.** *Leaves* alternate. *Flowers* 1-2-sexual, generally 2- or 4-merous; perianth tubular, lobes valvate. *Stamens* 4, epiphyllous. *Ovule* erect. *Fruit* indehiscent, enclosed in the accrescent perianth-tube. *Albumen* scanty or 0.

**** Ovary inferior.**

Generally parasitic shrubs or trees. *Leaves* in most cases opposite, entire, exstipulate. *Stamens* as many as the perianth-lobes and inserted on and opposite to them. *Ovules* without integuments. *Fruit* 1-seeded, generally drupaceous. *Seeds* albuminous.

75. **Loranthaceae.** Parasitic on branches of trees. *Leaves* sometimes wanting when the branches are articulate and more or less flattened. *Flowers* 1-2-sexual; perianth sometimes double, the outer then is short and truncate, and the inner usually long; lobes always valvate. *Ovule* solitary, erect.

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76. **Santalaceae.** Parasitic on roots. *Leaves* opposite or alternate. *Flowers* generally 2-sexual; sometimes polygamous. *Placentation* free-central; *ovules* 1-4, pendulous. *Fruit* a drupe. *Seed* solitary.

Series 2.—*Flowers* 1-sexual. *Perianth* regular or irregular, sometimes wanting. *Ovary* 1-6-celled. *Leaves* mostly simple and alternate.

* *Ovary superior.*

A. Trees, shrubs or herbs, sometimes with milky juice. *Leaves* generally simple and stipulate. *Perianth* usually single, rarely double or none. *Ovary* as a rule 3-celled with 1 or 2 suspended ovules in each cell; styles as many as the carpels. *Fruit* various. *Seeds* albuminous.

77. **Euphorbiaceae.** Same characters as of the Order.

B. *Leaves* simple, stipulate, generally hirsute. *Perianth* simple, of 3-5 free or connate segments, regular, rarely absent. *Stamens* usually opposite to the perianth-segments. *Ovary* usually 1-celled, 1-ovuled; style often eccentric. *Fruit* various, never a capsule. *Seeds* with or without albumen.

78. **Urticaceae.** Trees, shrubs or herbs, sometimes with milky juice. *Flowers* monœcious or diœcious; perianth always present. *Stamens* often inflexed in bud with reversed anthers. *Embryo* straight.

C. Trees or shrubs. *Leaves* simple and sometimes reduced to scales. *Flowers*, both male and female, in catkins or spikes, usually bracteate. *Perianth*, if present, of 4-6 segments with the stamens inserted on them. *Ovary* 1-celled; ovules few or numerous. *Seeds* exalbuminous.

80. **Myricaceae.** *Leaves* exstipulate. *Flowers* monœcious or diœcious perianth none. *Stamens* inserted on bracts. *Ovary* sessile, of 2 carpels but 1-celled, 1-ovuled; style 2-fid. *Ovule* erect, orthotropous.

82. **Salicaceae.** *Leaves* stipulate, buds enclosed in scales. *Flowers* diœcious, each in the axil of a bract; perianth none. *Stamens* 2-6 on a glandular disk. *Ovary* often stipitate, of 2 carpels but 1-celled; style simple or 0. *Ovules* many; generally on parietal placentas. *Fruit* a loculicidal capsule. *Seeds* coinose.

** *Ovary inferior.*

Trees or shrubs. *Leaves* alternate. *Flowers* monœcious, male in catkins, female solitary or spicate. *Perianth* green, generally gamo-

phyllous. *Ovary* 1-6-celled; ovule solitary, pendulous or basal. *Seeds* without albumen.

79. **Juglandaceae.** *Leaves* imparipinnate, without stipules. *Flowers* bracteate. *Perianth* in male flowers flat and adnate to the supporting bract which is stipitate, in the female flowers imperfectly double. *Stamens* indefinite. *Female flowers* solitary or spicate. *Style* 2-fid. *Fruit* a drupe or nut; cotyledons contorted or corrugated.

81. **Cupuliferae.** *Leaves* simple, stipulate, coriaceous. *Flowers* generally bracteate. *Male perianth* with 1-5 segments or wanting; female tubular, adnate to the ovary and supported by an involucre of bracts. *Ovary* 3- or 4-5-celled with 1 or 2 pendulous ovules in each cell; style 3-5-armed. *Fruit* usually a 1-celled nut included within, or supported by enlarged bracts. *Seeds* pendulous.

b. MONOCOTYLEDONS.

Roots usually fibrous and often fascicled at the base of the plants. There is no separable *bark*, and no continuous *cambium layer*. *Leaves* sheathing, and usually with parallel veins. *Flowers* as a rule 3-merous. *Embryo with only one cotyledon*.

Sub-Class i. PETALOIDEÆ.

Flowers with a coloured perianth, solitary or in umbels or racemes. *Fruit* a capsule or a berry.

Series 1.—*Ovary inferior*.

83. **Scitamineae.** Perennial herbs. *Leaves* penninerved. *Flowers* usually spicate, 2-sexual, irregular. *Perianth* of 6 segments, 2-seriate, inner or both petaloid. *Stamen* only 1 fertile (5 fertile stamens in *Musa*) others reduced to staminodes. *Ovary* usually 3-celled. *Fruit* a capsule or a berry.

84. **Dioscoreaceae.** Twining herbs with a tuberous underground rootstock. *Leaves* alternate or opposite, simple or digitate. *Flowers* 1-sexual. *Perianth* 6-cleft. *Stamens* in male flowers 6 or only 3 perfect. *Staminodes* in female flowers 3 or 6. *Ovary* inferior, 3-celled, 3-gonous; cells 2-ovuled. *Fruit* a 3-winged loculicidal capsule. *Seeds* flat, winged.

Series 2.—*Ovary superior*.

85. **Liliaceae.** Herbs rarely shrubs, usually with bulbous or creeping rootstocks. *Flowers* 2-sexual, usually regular. *Perianth* petaloid, 6-merous. *Stamens* 6. *Ovary* 3-celled; cells 2- or more ovuled. *Fruit* a capsule or a berry.

Sub-Class ii. *SPADICIFLORÆ*.

Flowers not coloured, arranged on a more or less fleshy *spadix*. *Ovary* superior. *Fruit* a berry or a drupe. *Seeds* with copious albumen.

A. *Flowers* generally 1-sexual, monœcious or diœcious. *Stem* erect or scandent, sometimes very long. *Inflorescence* at first enclosed in a coriaceous spathe. *Perianth* of 2 series, each of 3 coriaceous segments. *Stamens* 6, on base of the perianth; anthers usually versatile. *Ovary* 1-3-celled or of 3 distinct carpels; stigmas 3, usually sessile.

86. **Palmeæ.** Stems erect or scandent, sometimes armed. *Leaves* usually large, alternate, pinnatifid or palmatifid. *Inflorescence* at first enclosed in a coriaceous spathe. *Flowers* usually small, 1-sexual, monœcious or diœcious. *Perianth-segments* 6, in 2 series. *Stamens* 6, on base of the perianth; *anthers* usually versatile. *Ovary* 1-3-celled or of 3 distinct carpels; *Orules* 1-2 in each cell. *Fruit* a berry or a drupe.

B. Generally fleshy plants. *Flowers* small and numerous, usually monœcious, borne on a spadix or a panicle with thick branches, generally enclosed in a much developed spathe. *Perianth* polyphyllous or wanting. *Ovary* syncarpous or apocarpous. *Embryo* minute, straight.

87. **Typhaceæ.** Aquatic herbs. *Leaves* linear, sessile. *Flowers* monœcious, minute, densely crowded on bracteate spikes. *Male flowers* with usually 1 stamen; filament capillary. *Ovary* 1-2-celled. *Fruit* a minute drupe.

88. **Araceæ.** Fleshy plants, sometimes scandent. *Flowers* usually without a perianth. *Anthers* sessile, 2-4-celled. *Ovary* sessile, 1-3-celled. *Fruit* a berry.

Sub-Class iii. *GLUMIFLORÆ*.

Flowers supported by glumes in variously arranged spikelets. *Fruit* a caryopsis. *Seeds* albuminous.

Order 1. **Glumales.**

Ovary superior, 1-celled. *Ovule* erect.

89. **Cyperaceæ.** Grass-like herbs, generally with 3-quetrous stems. *Leaves* tristichous; sheaths entire. *Flowers* subtended by a single glume. *Perianth* reduced to bristles or scales, or 0. *Stamens* 1-3; anthers innate. *Style* with 2-3 stigmatose branches. *Fruit* 3-gonous. *Embryo* central.

90. **Gramineæ.** Herbs, shrubs or trees, generally with terete jointed stems. *Leaves* alternate, usually narrow; sheaths split in front to the base, distinct from the blade, often with a ligule at the apex. *Flowers* 1-2-sexual, subtended by

several distichous imbricate glumes. *Perianth* of 2 or 3 minute hypogynous scales (lodicules) or 0. *Stamens* in most cases 3, rarely 6 or more, hypogynous; anthers versatile. *Styles* 2-3, stigmatose throughout. *Fruit* terete or compressed. *Embryo* basal and generally lateral.

B. GYMNOSPERMS.

Shrubs or trees with *separable bark* and imperfectly developed unisexual *flowers*. *Anthers* usually borne on the back of scales, the *filaments* not being developed. *Ovules* are produced in an open ovary formed by a scale, and are fertilized by the direct application of the *pollen*, the *style* and *stigma* being absent. *Cotyledons* 2 or more.

91. **Gnetaceae.** Trees or shrubs with articulated branches. *Leaves* opposite, minute or large. *Flowers* in spikes or cones. *Anthers* 2-8 on a column of combined filaments. *Ovule* exposed, erect, one of its coats forming a protruding tube resembling a style. *Cotyledons* 2.

92. **Coniferae.** Generally large evergreen trees with monopodial stems; good without pores. *Leaves* alternate or fascicled, generally acicular. *Flowers* generally monoecious. *Male flowers* in deciduous catkins. *Female flowers* of one or more exposed ovules borne on a carpellary scale, arranged spirally round an axis to form a cone. *Seeds* usually variously winged. *Cotyledons* generally more than 2.

DICOTYLEDONS.

THALAMIFLORÆ.

Order 1.—*RANALES*.

I. *RANUNCULACEÆ*.

HERBS or climbing shrubs. *Leaves* alternate, rarely opposite, usually exstipulate, simple, much divided or compound. *Flowers* usually regular, generally ebracteate. *Sepals* 4-5 or more, usually deciduous, often coloured. *Petals* 3-5 or more, often minute or deformed, or totally absent. *Stamens* usually numerous, hypogynous, free. *Carpels* many or few, free, 1-celled, 1- or more-ovuled. *Stigma* simple. *Fruit* either of many achenes, or of follicles, rarely a berry. *Seeds* albuminous.

1 *Clematis*, Linn.

Climbing shrubs. *Leaves* opposite, exstipulate, usually compound. *Flowers* in axillary or terminal fascicles or panicles, rarely solitary. *Sepals* usually 4, valvate, petaloid. *Petals* 0. *Stamens* and *carpels* indefinite. *Fruit* a head of achenes usually with feathery styles.

Analysis of the Species.

Flowers in axillary fascicles.

Flowers white or cream-coloured.

Sepals erect; pedicels with
connate bracts

1. *C. napaulensis*.

Sepals spreading; pedicels without
bracts

2. *C. montana*.

Flowers dull-purple

3. *C. barbellata*.

Flowers in axillary panicles.

Sepals spreading.

Flowers 3-5 in. diameter leaflets
usually glabrous

4. *C. gouriana*.

Flowers 7-1 in. diameter; leaflets
more or less hairy.

Leaflets hairy

5. *C. grata*.

Leaflets downy

6. *C. puberula*.

Sepals erect.

Petioles connate into a flat cup

connata.

Petioles not so connate.

Leaves decompositely pinnate

8. *C. nutans*.

Leaves simply pinnate

9. *C. Buchananiana*.

1. ***C. napaulensis***, DC.; Fl. Br. Ind. i. 2.

A slender climber. *Leaves* ternately divided; common petiole 1-1.5 in.; terminal leaflet or lobe 2-3 by 3-5 in., lateral half as long or shorter, sessile or very shortly petioluled. *Flowers* many; pedicels 1-2 in. long, with two hyaline bracts joined into a cup, pubescent above the cup. *Sepals* 4, erect, cream-coloured. *Filaments* glabrous, base broad. *Achenes* flat, hairy; style 1.5 in. long in fruit.

Valleys in HIGHER HILLS above 6,000 ft., scarce.—Matkángará, Deotá, Mussoorie, etc.

Fl. Cold season. Fr. May.

2. ***C. montana***, Ham.; Fl. Br. Ind. i. 2; Brandis Ind. Trees 1; Gamble Man. Ind. Timb. 2. Vern. *Kauniá-báli*, Jaunsar.

Stem thick, often 3 in. in diameter; young parts pubescent. *Leaves* 3-foliolate, fasciated at the nodes, glabrescent; petiole 1.5-3 in. long. *Leaflets* 1-3 in. long, ovate, toothed; petiolule 1-3 in. *Flowers* 2-3 in. diam., white; peduncles 2-4 in. long, generally exceeding the leaves. *Sepals* 4, sometimes connate, 1-2 in. long, elliptical, spreading pure-white. *Filaments* linear, short. *Carpels* hairy; style 6-1 in. long, rather stout densely hairy.

JAUN SAR and TEHRI-GARHWAL, 6-9,000 ft., fairly common. A very conspicuous plant during the month of May on account of its beautiful sprays of large white flowers, trailing over the tallest trees and very frequently over Deodar.

Fl. Apr., May.

3. **C. barbellata**, Edgew.; Fl. Br. Ind. i. 3; Gamble Man. Ind. Timb. 2. Vern. *Kauni*, Jaunsar.

Stem rather thin. *Leaves* 3-foliolate, much like those of the last species. *Flowers* dull-purple, in axillary fascicles; pedicels 1·5-3 in. long. *Sepals* 6·8 in. long, erect, pubescent on both surfaces, greyish-purple outside, villous at the margins. *Filaments* linear, often hairy, as long as the sepals or shorter; anthers bearded at the back (whence the specific name). *Achenes* glabrous or puberulent; style 1·5-1·8 in. long, brown-hairy.

JAUN SAR, TEHRI-GARHWAL and OUTER HIMALAYA, above 7,000 ft., in shady places.—Mundāli, Deoban; Deotā; Mussoorie, etc.

Fl. May, June.

4. **C. gouriana**, Roxb.; Fl. Br. Ind. i. 4; Brandis Ind. Trees 2. Vern. *Bel Kūm*, *Bel Kangu*, Dūn.

Stem thick, striate; branches purple. *Leaves* bipinnate or biternate. *Leaflets* 2·3·5 in. long, ovate, oblong or lanceolate acuminate, entire or distantly toothed, cordate or rounded at the base, rather coriaceous, wholly glabrous or rarely pubescent beneath. *Flowers* greenish-white, small, in dense axillary panicles. *Sepals* 2·3 in. long, oblong, revolute; margins tomentose. *Filaments* narrow. *Achenes* lanceolate; style 1·5-2 in. long in fruit, very slender.

Common in the DŪN and up to 4,000 ft. in the OUTER HIMALAYA. Also found in the SIWALIKS.

Fl. Aug., Sept.

5. **C. grata**, Wall.; Fl. Br. Ind. i. 3; Brandis Ind. Trees 1; Gamble Man. Ind. Timb. 2.

Stem woody, deeply furrowed. *Leaves* pinnate; *leaflets* usually 5, rarely only 3, 1·5-3 in. long, ovate to ovate-lanceolate, often cordate, acuminate, inciso-serrate or 3-lobed, hairy on both surfaces or glabrate above. *Flowers* cream-coloured, fragrant, in many-flowered panicles, often longer than the leaves. *Sepals* spreading 2·5-3·5 in. long, ovate-oblong, tomentose outside. *Filaments* glabrous. *Achenes* densely pubescent.

JAUN SAR. TEHRI-GARHWAL, outer HIMALAYA, in valleys, 3-8,000 ft., not very common; Mussoorie; Thadiar; etc.

Fl. July. Sept. Fr. Oct., Nov.

6. *C. puberula*, Hook. f. & T.; Fl. Br. Ind. i. 4.

Stem grooved, moderately thick, downy. *Leaves* pinnate. *Leaflets* 1-1.5 in. long, ovate-lanceolate, entire or toothed, downy. *Panicles* shorter than the leaves, few-flowered; branches opposite, subtended by leaf-like green bracts. *Sepals* 5, .5 in. long, silky without. *Achenes* ovoid, silky; style about 1 in. long in fruit.

Valleys in the HIMALAYA, at 2,-4,000 ft.; Tiuni, Májog, Dhár-migádh, etc.

Fl. Sept., Oct.

7. *C. connata*, DC.; Fl. Br. Ind. i. 6. Vern. *Káuni-báli*, Jaunsar.

Stem thick; young parts with scattered hairs. *Leaves* pinnate or 3-foliate, glabrous; petiole connate into a large flat cup (whence the specific name). *Leaflets* 2-4 in. long, broad-ovate, serrate or lobed; base cordate. *Panicles* many-flowered. *Flowers* white, large. *Sepals* oblong, hairy, not ribbed. *Filaments* tapering, hairy. *Achenes* ovate, pubescent; style 1.5-2 in. long in fruit.

Forests of UPPER HILLS above 5,000 ft., not very common; Bhújkōti, Mundáli, Konáin, etc.

Fl. May, June. Fr. Sept., Oct.

8. *C. nutans*, Royle; Fl. Br. Ind. i. 5; Gamble Man. Ind. Timb. 2. Vern. *Nák-chhikni*, *Kángúli*, Málkōt; *Káuni*, Jaunsar.

Stem slender, woody, furrowed, very pungent to the taste. *Leaves* decompositely pinnate. *Leaflets* 1-3 in. long, ovate or lanceolate, usually 3-5-lobed, silky. *Flowers* cream-coloured, in much branched panicles; pedicels with a pair of green bracts which are often leaf-like and subtend flower-buds. *Sepals* .5-7 in. long, oblong, closely nerved, silky outside. *Filaments* tapering, silky near the base. *Achenes* large, silky-hairy; style 1-1.5 in. in fruit, very slender.

OUTER HIMALAYAN slopes, 3,-5,000 ft.; Málkōt, above Rájpur, etc., ravines near Dehra Dún.

The leaves are very pungent to the taste and produce violent sneezing if smelt after bruising.

Fl. Nov., Dec.

9. **C. Buchananiana**, DC.; Fl. Br. Ind. i. 6; Brandis Ind. Trees 2; Gamble Man. Ind. Timb. 2. Vern. *Kāuni Bāli*, Jaunsar.

Stem thick, woody; branches widely climbing, pubescent when young. *Leaves* simply pinnate. *Leaflets* 2-4 in. long, ovate or orbiculate, coarsely lobed or serrate, pubescent; base cordate. *Flowers* large, cream-coloured, sweet-scented, in many-flowered panicles. *Sepals* thick, ribbed, softly silky-tomentose. *Filaments* and *achenes* densely hairy.

Villages in the HIMALAYA above 4,000 ft. Scarce in JAUN SAR, but common in parts of TEHRI-GARHWAL, e.g., Mautārgādh.

Fl. Oct., Nov.

C. acuminata, DC.; Fl. Br. Ind. i. 5; Brandis Ind. Trees 2; has been found at the Bear-garden near Chakrata; also Mussoorie. It is a slender climber with glabrous leaves and cream-coloured flowers. *Roots* thick, fleshy, tuberous.

The following plants of herbaceous Genera are commonly met with and deserve mention :—

1. *Anemone vitifolia*, Ham.; Fl. Br. Ind. i. 8.—A perennial herb with 5-lobed radical leaves. *Flowers* large, white, in many-flowered scapes. *Seeds* white, woolly. Chakrata and the hills beyond, also Mussoorie and Mālkot.

2. *A. obtusiloba*, Don.; Fl. Br. Ind. i. 8. Vern. *Ageli*, Jaunsar. A herb with a thick densely white-woolly root-stock. *Radical leaves* 3-lobed, deeply cordate, densely silky-pubescent. *Flowers* varying in colour from blue to white. Above 8,000 ft., Mundāli Deoban, etc.

3. *A. rivularis*, Ham.; Fl. Br. Ind. i. 9. *Stem* branched. *Radical leaves* 3-lobed. *Flowers* in many-flowered compound cymes, bluish outside. *Achenes* dark-brown, lanceolate, hooked at the tip. In damp places and snow gullies in the HILLS, above 5,000 ft.

4. *Thalictrum foliolosum*, DC.; Fl. Br. Ind. i. 14. An erect perennial herb 4-8 ft. high. *Leaves* pinnately decomposed with auricled sheaths. *Flowers* polygamous, in much-branched panicles. Jaunsar, Tehri-Garhwal, Dehra Dun, and throughout the Himalaya, 3,000—9,000 ft. The root, *maniri* is a valuable remedy for ophthalmia, and is also used as a febrifuge.

5. *Delphinium denudatum*, Wall.; Fl. Br. Ind. i. 25. The Larkspur. Vern. *Main*, Jaunsar. Very conspicuous in the spring season on dry grassy slopes in the hills up to 8,500 ft. *Stem* branched. *Radical leaves* 5-9-partite, orbicular. *Flowers* pale-blue, with a subulate spur. *Fruit* of 3 follicles.

6. *D. vestitum*, Wall.; Fl. Br. Ind. i. 26. Common in the Tutuagádh near Mundáli and on the northern slopes of Rikhshin, generally in shady ravines, 6.-12,000 ft. Stem 1.5-3 ft. long, hispid. Radical leaves 6-12 in. in diam., 5-7-lobed; lobes rounded, cut or toothed. Flowers dense, bluish-white; spur inflated, conical, incurved. Fruit of 3 foliicles.

7. *Actea spicata*, Linn.; Fl. Br. Ind. i. 29. An erect perennial herb with 3-nately compound leaves and small white flowers in crowded racemes. Sepals and petals similar. Fruit a berry. Shady ravines in JAUNSA and TEHRI-GARHWAL.

8. *Pæonia emodi*, Wall.; Fl. Br. Ind. i. 30. A tall almost shrubby plant, remarkable for its large showy white or pink flowers, found in the upper Tons Valley, as in ravines above Naintwár and at Dátmir and elsewhere from 7,000 to 10,000 ft.

II. DILLENIACEÆ.

Trees or shrubs, rarely herbs. Leaves alternate, simple, generally without stipules. Flowers large, showy. Sepals 5, imbricate, persistent. Petals 5, rarely 3 or 4, deciduous. Stamens numerous, hypogynous, in many series. Carpels solitary or numerous, free or cohering at the base on the axis. Styles distinct. Seeds solitary or many, albuminous, arillate or immersed in pulp.

1. *Dillenia*, Linn.

1. *D. indica*, Linn.; Fl. Br. Ind. i. 36; Brandis For. Flora 1. Ind. Trees 3; Gamble Man. Ind. Timb. 4. Vern. *Chálta*, Hind.

An evergreen tree in its habitat but generally leafless for a short time in June at Dehra Dún; bark reddish-grey, red inside, peeling off in hard flakes. Leaves generally approximate at the ends of the branches, 8-12 in. long, oblanceolate or oblong-lanceolate, sharply serrate, acute or acuminate, glabrous above, usually pubescent beneath; lateral nerves very numerous, parallel, prominent; petiole sheathing at the base. Flowers terminal, solitary, 6-8 in. across. Sepals orbicular, thick and fleshy, with membranous

margins, spreading in flower, accrescent and enclosing the ovary in fruit. *Petals* 3-4 in. long, obovate, white, very tender. *Inner stamens* recurved. *Styles* bent outwards in radiating white rays. 7 in. long. *Fruit* a pseudocarp, 3-5 in. diam., fleshy, enclosed in the much thickened concave sepals. *Carpels* 16-20; seeds reniform, sunk in a glutinous pulp.

Commonly cultivated at DEHRA and SAHÁRANPUR.

Wood reddish-brown, mottled with white specks, weighing about 45 lbs. per c. ft., fairly durable; medullary rays broad and shining. The fleshy calyx has an agreeable acid taste, and is eaten raw or cooked.

Fl. June, July. Fr. ripens in the cold season.

III. MAGNOLIACEÆ.

Trees or shrubs, sometimes climbing; wood-tissue with glandular markings. *Leaves* alternate, simple, entire or toothed, usually stipulate; stipules convolute, deciduous. *Flowers* axillary or terminal, trimerous, often large. *Sepals* and *petals* usually similar, hypogynous, deciduous. *Stamens* indefinite, free or monadelphous; filaments usually flattened. *Carpels* indefinite, often arranged on an elongated torus; style usually short. *Fruit* of berry-like or follicular carpels, or like a woody cone. *Albumen* fleshy, uniform.

Analysis of the Genera.

Trees. Stipules conspicuous; stamens	
free	1. MICHELIA.
Climbing shrubs. Stipules none; sta-	
mens monadelphous	2. SCHIZANDRA.

1st *Michelia*, Linn.

1. *M. Champaca*, Linn.; Fl. Br. Ind. i. 42; Brandis For. Flora 3, Ind. Trees 8; Gamble Man. Ind. Timb. 12. Vern. *Champá*, Hind.

A tall, graceful, evergreen tree with dark-grey bark. *Leaves* 6-8 by 2-3·5 in., ovate or oblong-lanceolate, coriaceous, entire, glabrous, dark-green and shining above, enveloped in convolute stipules in bud; main lateral nerves 8-14 pairs; base acute; petiole 1-1·2 in. long. *Flowers* solitary, axillary, bracteate, pale-yellow, very fragrant; peduncle short, stout; bracts small, deciduous. *Sepals* and *petals* 15-21, in several series, those of the inner series gradually narrower. *Fruit* 3-4 in. long; carpels 5-7 in. long, subsessile, dark-coloured, with white specks.

Cultivated in the DŪN, and also in the SAHĀRANPUR DISTRICT.

Heartwood light olive-brown, very durable, seasons and polishes well; weight about 38 lbs. per c. ft. It is used for furniture. The flowers are used by Hindus in religious ceremonies and are indispensable on certain occasions.

Fl. chiefly Apr., June, but occasionally throughout the year.

2. *Schizandra*, Michaux.

Sinistrorsely climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* axillary, 1-sexual and dioecious, white, yellow or orange. *Sepals* and *petals* 9-12, generally in 3 series. *Stamens* 5-15 or more, spirally arranged; filaments usually monadelphous and short or wholly connate into a fleshy head; anthers free, or sessile and half-buried in the head of connate filaments; cells small, remote. *Carpels* many, densely imbricated; stigma sessile; ovules 2, pendulous. *Fruit* an elongated spike of 1-seeded globose carpels. *Seeds* with copious albumen.

Analysis of the Species.

Filaments free above; anthers free . 1. *S. grandiflora*.

Filaments connate into a fleshy head;

anthers imbedded in the head . 2. *S. propinqua*.

1. *S. grandiflora*, Hook. f. & T.; Fl. Br. Ind. i. 44; Brandis For. Flora 571, Ind. Trees 9; Gamble Man. Ind. Timb. 14. Vern. *Bállon*, *Báni*, *Jaunsar*.

A climber with dark brown smooth bark and short leaf-bearing branches at the nodes. *Leaves* 3-6 in. long, elliptic to oblong-lanceolate, acuminate, distantly glandular-toothed, rather soft and fleshy, shining above, pale beneath; lateral nerves 6-8 pairs, faint; base acute; petiole .5-1 in. long. *Flowers* diœcious axillary, white, fragrant, about 1 in. diam.; pedicels 1-2 in. long, of male flowers somewhat shorter. *Sepals* and *petals* 9-12, imbricate. *Stamens* in a spiral series, monadelphous below, free and tubular above. *Ovaries* imbricated on a conical receptacle which lengthens in fruit into a fleshy axis 6-9 in. long, bearing numerous scarlet carpels.

JAUN SAR and TEHRI-GARHWAL, 6,-10,000 ft., affecting shady places: Deoban, Mundáli; Bámsu, Deotá, etc. Common but not abundant.

Fl. May, June. Fr. July, Aug.

2. **S. propinqua**, Hook. f. & T.; Fl. Br. Ind. i. 45; Brandis Ind. Trees 9; Gamble Man. Ind. Timb. 14.

A stout climber with dark-brown stem and rough verrucose branches. *Leaves* 4-6 by 1.5-2 in., ovate-lanceolate, acuminate, obscurely gland-toothed, subcoriaceous, dark-green; lateral nerves 10-12 pairs, not prominent; base rounded; petiole .4-.6 in. long, rather stout. *Flowers* .5-.7 in. diam., yellowish; pedicels .4-.7 in. long, bracteolate. *Sepals* and *petals* imbricate, concave in bud. *Stamens* connate into a globose head about .3 in. diam.; anthers sessile, half-exserted. *Ovaries* and *fruit* as in the preceding species.

Very scarce. Korwá forests, JAUN SAR; also below Mus-sooríe. About 5,-6,000 ft.

Fl. June, July.

Magnolia grandiflora, Linn. An evergreen tree with rusty-pubescent buds and branchlets. *Leaves* oblong to obovate, thick and firm, shining above, rusty-pubescent beneath, 5-8 in. long. *Flowers* white, fragrant, 6-8 in. across. Indigenous to Southern United States but cultivated in gardens in the Dun.

IV. ANONACEÆ.

Trees or shrubs, often aromatic. *Leaves* alternate, simple, entire, exstipulate. *Flowers* usually 2-sexual.

Sepals 3, free or connate, generally valvate. *Petals* 6. hypogynous, in two series, the inner sometimes absent. *Stamens* indefinite, filaments short or none; anthers adnate, with a connective enlarged to form a dilated or truncate head. *Ovaries* usually numerous, apocarpous. (Syncarpous in *Anona*); style short or stigma sessile. *Fruit* of dry or succulent usually indehiscent carpels. *Seeds* large; testa horny; albumen ruminant.

1. *Miliusa*, Leschen.

1. *M. velutina*, Hook. f. and Th.; Fl. Br. Ind. i, 87; Brandis For. Flora 6, Ind. Trees 11; Gamble Man. Ind. Timb. 21. Vern. *Dôm Sâl*, Hind.; *Guá Sâl*, Garhwal.

A middle-sized deciduous tree; young branches tomentose; bark dark-grey, rough; inner substance dirty brown. *Leaves* 6-10 by 3-5-6 in., ovate-elliptic or oblong, acute or acuminate, entire, softly tomentose on both surfaces, aromatic; base cordate; petiole 1-2 in. *Flowers* pale yellow, in 3-6-flowered, lax, leaf-opposed racemes; peduncles 1-5 in. long, pedicels 2-4 in., slender. *Sepals* and *outer petals* similar, 1 in. long, ovate, valvate in bud; *inner petals* longer, broad-ovate, dark-brown, densely tomentose outside. *Stamens* on a cylindrical torus; anthers distinct. *Fruit* of a number of black dry 1-2-seeded berry-like carpels, on short stipes.

Common in the Sâl forests of DEHRA DÚN and SAILÁRANPUR, generally in ravines, or in open scrubby jungles.

Heartwood not distinct. The seasoned wood is fairly hard, light, of pretty grain; weight 40-50 lbs. per c. ft. It is used for agricultural implements, and in constructions of a temporary character.

Fl. Mar.-May. Fr. June, July.

To this Family belongs—

1. *Aralotrys odoratissimus*, R. Br.; Fl. Br. Ind. i, 54; Brandis Ind. Trees 21; Gamble Man. Ind. Timb. 16. A large scrambling glabrous shrub with very fragrant yellowish flowers. Often cultivated in gardens.

V. MENISPERMACEÆ.

Climbing or twining, rarely erect shrubs. *Leaves* alternate, simple, entire or lobed, usually palminerved, exstipulate. *Flowers* small, usually dioecious. *Sepals* and *petals* similar, generally 6 each, in series of 3, the outermost whorl of sepals very minute. MALE FLS.: *Stamens* usually 6, opposite to the petals, hypogynous; filaments or anthers free or connate. FEM. FLS.: *Carpels* 3, rarely 1, 6, or more; styles ultimately lateral or sub-basal; ovules solitary. *Fruit* a 1-seeded drupe. *Seed* curved into a crescent shape (whence the name of the Order), enclosed in a woody endocarp, usually with copious albumen.

Analysis of the Genera.

Leaves not peltate—

- | | |
|---|---------------|
| Leaf-base acute or slightly cordate | 1. COCCULUS. |
| Leaf-base deeply cordate | 2. TINOSPORA. |

Leaves peltate—

- | | |
|---|-----------------|
| Glabrous, flowers umbellate | 3. STEPHANIA. |
| Tomentose; flowers in cymes or clustered in the axils of orbicular bracts | 4. CISSAMPELOS. |

1. *Cocculus*, DC.

Climbing or erect shrubs. *Flowers* panicled. *Sepals* 6, in two series. *Petals* 6, concave, embracing the stamens in the male flowers. *Styles* usually cylindrical. *Drupe* circular, laterally compressed; endocarp horse-shoe-shaped, tubercled.

Analysis of the Species.

- | | |
|--|----------------------------|
| A large erect shrub. Leaves glabrous | 1. <i>C. laurifolius</i> . |
| A climbing shrub. Leaves villous | 2. <i>C. hirsutus</i> . |

1. *C. laurifolius*, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9, Ind. Trees 26; Gamble Man. Ind. Timb. 25. Vern. *Til-dhāra*, Dún and Garhwal.

A large evergreen shrub with a short trunk and thin grey bark; branchlets with tufts of hairs at the base. *Leaves* 3-6 in. long, lanceolate, entire, dark-green and shining above, slightly pale beneath; base 3-nerved, acute; petiole .1-3 in. *Panicles* axillary, solitary or 2 together, corymbose. *Flowers* minute; petals 2-lobed. *Styles* reflexed. *Drupe* .15 in. diam., black when ripe.

Shady woods and moist places up to 4,000 ft. Banks of the Sông opposite Kâluwala, Nakraunda, Bindâl nalâ, etc., in the DŪN JUMNA VALLEY down to Dâkhpâthâr. Moist ravines in the LOWER HILLS.

The wood is of a curious structure, having belts of corky tissue alternating with woody bands and looking like annual rings, which they obviously are not, as they frequently anastomose. It is used only for fuel.

Fl. April-June.

2. *C. hirsutus*, Diels.; Syn.—*C. villosus*, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9, Ind. Trees 26; Gamble Man. Ind. Timb. 25.

A climbing undershrub with tomentose branchlets. *Leaves* very variable in size, the largest 3 by 2 in., ovate or ovate-oblong, mucronate, clothed with grey tomentum; petiole up to .5 in. *Male fls.* in axillary panicles; *fem. fls.* 1-3 together on short axillary pedicels. *Drupe* .2 in. diam., dark-purple.

Foot of the HIMALAYA and SIWALIK FORESTS, not very common.

"The juice of the ripe berries makes a durable bluish-purple ink."—*Sir D. Brandis*. The roots and leaves are used medicinally.

Fl. Feb.-Mar.

2. *Tinospora*, Miers.

T. malabarica, Miers; Fl. Br. Ind. i. 96; Brandis Ind. Trees 24; vern *Gurch*, *Giloe*, *Gulanča*, Hind.

A large climber; *stems* about 2.5 in. diameter, smooth and shining, lenticellate, with light-coloured, papery bark; branchlets pubescent. *Leaves* 4-8 in. in diameter, broadly ovate or orbicular, deeply cordate, 7-nerved, shortly acuminate, pubescent above, tomentose beneath; *petiole* 2.5-6 in. long, thickened and twisted at the base. *Flowers* greenish yellow, in racemes 3-6 in. long, usually from the old wood; pedicels slender, usually solitary in the female, clustered in the male. *Male flowers*: *Sepals* 6 in two series, the outer small, ovate-oblong, obtuse, concave, the inner larger,

suborbicular, membranous, flat, .15 in. long. *Petals* 6, clawed membranous, smaller than the sepals. *Stamens* 6; *filaments* free, thickened at the apex. *Female flowers*: *Sepals* and *Petals* as in the male flower. *Staminodes* 6. *Ovaries* 3. *Drupe* 1-3, ovoid, smooth, crimson; endocarp tubercled.

On trees in shady places in the Dun and Saharanpur forests, fairly common.

This plant has long been taken for *Tinospora cordifolia*, Miers, which is perfectly glabrous and of which there are no specimens from the Dun in the Dehra Herbarium.

The root and stems are used in medicine as substitutes for *T. cordifolia*, Miers and are largely collected for this purpose.

Fl. Mar.-June; Fr. Cold season.

3. *Stephania*, Lour.

Perennial glabrous climbing shrubs. *Leaves* peltate, orbicular or more or less triangular: basal nerves numerous. *Flowers* small, umbellate: *Male flowers*: *Sepals* 6-10, free. *Petals* 3-5, fleshy. *Stamens* 6, *filaments* united in a column, the *anthers* connate forming a ring round the dilated top of the column, bursting transversely. *Female flowers*: *Sepals* 3-5. *Petals* as in the male. *Ovary* 1. *Style* 3-6-partite. *Drupe* glabrous; endocarp horse-shoe-shaped, compressed, dorsally tubercled.

1. *S. glabra*, Miers.; Syn.—*S. rotunda*, Hook. f. & Thoms. ex parte (non Lour.); Fl. Br. Ind. 1,103; Brandis Ind. Trees 23 (non Lour.); Gamble Man. Ind. Timb. 26 (non Lour.); vern. *Parhá*, Dun.

A tuberous-rooted climbing shrub; twigs ribbed. *Leaves* 3-7 in. diameter, broadly ovate or suborbicular often sinuate, peltate, with 9-11 radiating nerves, glabrous, pale beneath; *petiole* 3-8 in. long. *Flowers* .2 in. diam., greenish-yellow, in axillary compound pedunculate umbels; *peduncle* 1.5-3 in. long. *Sepals* 6, the three outer linear-oblong, the three inner spatulate. *Petals* shorter than the sepals. *Drupe* pisiform, red.

Common in ravines in the Dun and the Lower Hills; Dehra Dun; Rajpore, etc.

Fl. Rainy season.

S. elegans, Hook. f. & Thoms.; Fl. Br. Ind. i. 103; Brandis Trees 23; Gamble Man. Ind. Timb. 26, has been found at Mussoorie and may also occur elsewhere. It is a slender climber with elongate-deltoid, entire leaves and red fruits.

4. *Cissampelos*, Linn.

C. Pareira, Linn.; Fl. Br. Ind. i. 103; Brandis Ind. Trees 23; Gamble Man. Ind. Timb. 26. Vern. *Hārjori*, *Dakh-nirbisi*, Hind; *Parhé*, Dun and Garhwal.

A slender climber with a perennial root-stock, which annually throws out long twining branches covered with grey tomentum. *Leaves* 1·5-4 in. long, triangularly broad-ovate, or orbicular, usually peltate, obtuse, mucronate, base cordate or truncate, more or less tomentose on both sides, ultimately glabrous above, glaucous beneath; *petiole* 1·5-4 in. long, pubescent. *Flowers* minute. *Male* flowers in pedunculate, branched cymes, clustered in the leaf-axils or on long axillary, raceme-like shoots, each cyme in the axil of a small leaf; *pedicels* filiform. *Sepals* 4, obovate-oblong, hairy outside. *Petals* 4, united into a 4-lobed cup, hairy outside. *Stamens* 4; *filaments* united in a very short column; *anthers* connate encircling the top of the column. *Female* flowers clustered in the axils of orbicular, hoary, imbricate bracts, arranged in long, axillary racemes. *Sepal* 1, ovate-oblong, pubescent outside. *Petal* 1, about half the length of the sepal. *Ovary* 1, hairy; *style* shortly 3-fid. *Drupe* 2 in. diameter, subglobose, compressed, hairy, red when ripe; endocarp transversely ridged.

Common in hedges in the Dun and at low levels in the hills. The leaves and roots are used in medicine, and the stem yields a strong fibre.

Fl. Rainy season.

VI. BERBERIDACEÆ.

Erect or climbing shrubs, rarely herbs, glabrous. *Leaves* alternate or fascicled, simple or compound, usually exstipulate. *Flowers* regular, yellow or white. *Sepals* and *petals* free, hypogynous, caducous, in 2-4 series, usually imbricate. *Stamens* hypogynous, usually as many as the petals and opposite to them. *Carpels*

1-3, rarely more, oblong; style short or 0; stigma dilated. *Fruit* baccate or dry.

Analysis of the Genera.

Climbing shrubs with digitate leaves 1. HOLBÆLLIA.

Erect shrubs—

Leaves simple 2. BERBERIS.

Leaves pinnate 3. MAHONIA.

1. *Holbællia*, Wall.

1. *H. latifolia*, Wall.; Fl. Br. Ind. i. 108; Brandis For. Flora 13, Ind. Trees 28; Gamble Man. Ind. Timb. 27. Vern. *Gophlá*, *Jangli Sharifá*, Mussoorie.

A climbing shrub; stem corky when old. *Leaves* alternate, digitate, 3-9-foliate. *Leaflets* very variable in size and shape, 3-5 by .5-2 in., broadly or narrowly ovate, oblong or ovate-lanceolate, entire, acuminate, generally coriaceous, shining above, pale beneath; common petiole 3-4 in., petiolule .3-1 in. long. *Flowers* monœcious, in axillary fascicles or racemes, purplish-green, sweet-scented. *Sepals* 6, in two series. *Petals* 6, minute. *Stamens* 6; anthers dehiscing by slits. *Berries* oblong, 2-3 in. long.

Shady ravines in the HILLS; above 5,500 ft.; Korwá Chakrata, Deotá, etc.

Fl. April-May. Fr. Sept.-Oct.

There are two distinct varieties of this plant:—

Var. *latifolia*, sp. Wall., with 3-5 ovate or oblong leaflets, common in the OUTER HILLS; and

Var. *angustifolia*, sp. Wall., with 5-9 linear-lanceolate leaflets, which occurs at and beyond Deotá.

2. *Berberis*, Linn.

The Barberries.

Spinous shrubs; wood yellow. *Leaves* pinnate and alternate, or simple and fasciculate. *Flowers* yellow, bisexual, 2-3-bracteate. *Sepals* 6, in two series. *Petals*

6, also in two series. *Stamens* 6, free ; anthers dehiscent by two recurved valves. *Ovary* simple ; stigma sessile or on a short style. *Fruit* a berry.

Analysis of the Species.

Flowers umbellate 4. *B. umbellata*.

Flowers in simple racemes—

Fruit red ; leaves membranous—

Lower pedicels .3 in. or more long 1. *B. petiolaris*.

Lower pedicels scarcely more than .2 in. long 2. *B. Zabeliana*.

Fruit blue ; leaves coriaceous—

Leaves narrow-oblongate, pedicels slender 7. *B. Lycium*.

Leaves obovate, finely reticulate, not glaucous beneath 6. *B. aristata*.

Leaves broadly obovate, strongly reticulate, glaucous beneath 8. *B. asiatica*.

Flowers in branched racemes—

A large shrub, twigs and panicle-branches red 5. *B. Chitria*.

A small shrub, twigs and panicle-branches not red 3. *B. Edgeworthiana*.

1. ***B. petiolaris***, Wall.; Syn. *B. vulgaris*, var. 1. *vulgaris* proper; Fl. Br. Ind. 1, 109; *B. vulgaris*, L., Brandis For. Flora 11, Ind. Trees 28; Gamble Man. Ind. Timb. 29. Vern. *Chatrod*, Jaunsar.

A small shrub with soft brown bark, 8-10 ft. high. *Leaves* deciduous, 1-3 in. long, broadly obovate or spatulate, membranous, finely serrate, narrowed into a slender petiole upto .75 in. long ; spines usually simple, often wanting. *Flowers* pale-yellow, in simple lax racemes which are generally longer than the leaves ; pedicels slender, the lower .3 in. or more in length. *Berries* oblong-ovoid, red when ripe.

Jaunsar and Tehri-Garhwal, 8-12,000 ft.; in moist shady places. Deoban ; Mussoorie ; not very common.

The Fruit is eaten.

Fl. April-May.

2. **B. Zabeliana**, C. K. Schn.; Bull. Herb. Boiss. Ser. II (1905) p. 667.

A small shrub, 4-8 ft. high; twigs yellowish or yellowish-brown, glabrous: spines small, slender, usually 3-branched, often simple. *Leaves* 1.25-3 in. long, elliptic-oblong to obovate, narrowed into a slender petiole, irregularly spinulose serrate, membranous, reticulations distinct on both surfaces slightly glaucous beneath; *petiole* upto .75 in. long. *Racemes* glabrous, upto 2.5 in. long, often pendulous; lower pedicels rarely exceeding .2 in. in length. *Berries* ovoid, red, .4 in. long.

Jaunsar and Tehri-Garhwal, 7,000-10,000 ft.; Konain; Mundali; Deoban, etc.

This species is closely related to *B. petiolaris*, Wall. but there is little difficulty in distinguishing the extreme forms of the two species. The leaf margin in *B. Zabeliana* has more numerous teeth and the reticulation is much more prominent. The pedicels are smaller and stouter and the raceme is denser flowered. Both species are, however, connected by numerous intermediate forms which often pass into each other. *B. Zabeliana* Sch. however is much more common than *B. petiolaris* within the area of this Flora.

3. **B. Edgeworthiana**, C. K. Schn.; Syn. *B. vulgaris*, var. *brachybotrys*; Fl. Br. Ind. i. 109.

A low rigid shrub, twigs pale-grey, glabrous. *Leaves* .5-1.5 in. long by about .5 in. broad, nearly sessile, lanceolate or oblanceolate, acute at the apex, narrowed towards the base, spinulose serrate, rarely entire, green above, pale beneath, reticulations distinct on both surfaces. *Panicles* usually slightly exceeding the leaves, dense-flowered, glabrous (bracts minutely pubescent). *Flowers* about .16 in. diam. *Berries* red.

Jaunsar and Tehri-Garhwal, 6-10,000 ft. Ganges Valley; Deoban; Mundali; Lakandi, etc.

Fl. May-July.

This is the plant which has been mentioned in the previous edition of this Flora under *B. vulgaris*, as var. *aetnensis*. The true *B. vulgaris*, var. *aetnensis* (*B. Kunawarensis*, Royle according to C. K. Schneider) which has the inflorescence and twigs pubescent has, however, never been collected within the area of this Flora.

4. **B. umbellata**, Wall.; Fl. Br. Ind. i. 110; Brandis Ind Trees 30; Gamble Man. Ind. Timb. 28.

A small shrub, generally occurring in gregarious patches; twigs glabrous, striate and somewhat angular. *Leaves* 1-2 in. long,

oblanceolate to obovate, rather membranous, sparingly serrulate. *Flowers* yellow, somewhat unevenly umbellate on a long peduncle; *pedicels* slender. *Berries* oblong.

JAUN SAR and TEHRI-GARHWAL, 9, -11,000 ft.: Gidhi Khad; Rikhshin, etc.

Fl. April, May.

5. **B. Chitria**, Lindl. Syn. *B. aristata*, var. 1, *aristata*, Fl. Br. Ind. i. 110; *B. aristata* Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 29. Vern. *Káshmoi*, Jaunsar; *Kingorá*, Garhwal.

An evergreen shrub 10-12 ft. high; branches usually bright red. *Leaves* 2-3 in. long, obovate or oblanceolate, rather coriaceous, entire or with a few remote teeth, in the axil of a 3-fid or simple spine. *Flowers* bright-yellow, in cymosely branched racemes; peduncle 1-1.5 in. long, red; branches few-flowered; *pedicels* .2-.3 in. long, also red. *Berries* tapering into a very short style, red.

JAUN SAR and TEHRI-GARHWAL, 6, -9,000 ft. Common.

An extract from the stem and roots (*Rasot*) is used in medicine.

Fl. April.- May. Fr. June, July.

6. **B. aristata**, DC.; Syn. *B. coriaria*, Gamble Man. Ind. Timb. 29; Brandis Ind. Trees 30 (non Royle). *B. aristata* var. *floribunda*, Wall.; Fl. Br. Ind. i. 110. Vern. *Káshmoi*, Jaunsar; *Kingorá*, Garhwal.

A large thorny shrub with grey bark; branches pale yellowish grey. *Leaves* 3-4 in. long, obovate, entire or distantly sharp-toothed, coriaceous; pale green beneath; veins very fine. *Flowers* usually in simple racemes which are 2-3 in. long; peduncle slightly angled; *pedicels* .2-.3 in. long; bracts persistent. *Berries* ovoid, bluish purple, covered with a glaucous bloom.

HIGHER HILLS, 7, -9,000 ft. Common at Bodyár, Konáin, Deoban and Lambátách.

Economic use as of *B. Chitria*.

Fl. May, June. Fr. July, Aug.

7. **B. Lycium**, Royle; Fl. Br. Ind. i. 110; Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 30. Vern. *Chatroi*, *Káshmal*, Jaunsar, *Dáruhaldi*.

A shrub usually much smaller than the last two species, and somewhat gregarious in habit; bark white. *Leaves* 1.5-2.5 in. long, narrow oblanceolate, subsessile, mucronate, coriaceous, glaucous beneath, with prominent reticulate veins. *Racemes* usually simple,

generally exceeding the leaves; peduncle glaucous. *Flowers* dull-yellow. *Berries* ovoid, bluish violet, with a distinct style at the apex.

JAUNSAR, TEHRI-GARHWAL, and OUTER HIMALAYA, 3,-7,000 ft. Quite abundant in certain localities; Korwá, Chakrata, Málkôt, below Mussoorie, etc.

Economic use as of the last two species.

Fl. April. Fr. May.

8. *B. asiatica*, Roxb.; Fl. Br. Ind. i. 110; Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 30. Vern. *Kingorá*, Dún and Garhwal.

A much-branched spreading shrub with pale bark. *Leaves* 2-3 in. long, broad-obovate, hard, coriaceous, strongly reticulate and grey beneath, usually with large distant spinous teeth. *Racemes* corymbose, dense-flowered, shorter than the leaves. *Flowers* .2 in. diam., pale-yellow. *Berries* .4-.5 in. long, ovoid, blue or black, glaucous.

LOWER HILLS, generally between 3,000 and 5,000 ft., but along the OUTER HIMALAYAN STREAMS as low down as Tháno, 2,400 ft., the Bindál nadi near Dehra, 2,200 ft., and in the Suswa near Phándowála, 1,800 ft.

Berry edible.

Fl. Feb., April. Fr. April, June.

3. *Mahonia*, Nutt.

M. nepaulensis, DC.; Syn. *Berberis nepalensis*, Spreng. Fl. Br. Ind. i. 109; Brandis Ind. Trees 28; Gamble Man. Ind. Timb. 28. Vern. *Khōru*, Jaunsar.

An erect evergreen shrub with soft corky bark. *Leaves* coriaceous, shining, imparipinnate, crowded towards the ends of branches, bearing two small subulate spinescent stipules on its broad sheathing base: *leaflets* 2-12 pairs, 2-3.5 in. long, ovate or lanceolate, sessile, with 3-8 large spinous teeth on either side, shining above. *Bracts* 1-2 in. long, persistent, clothing the ends of the branches; *bracteoles* broad-ovate or oblong, deciduous. *Racemes* dense-flowered. 4-10 in. long, erect, in the axils of the bracts. *Flowers* yellow; *pedicels* .3-.5 in. long. *Sepals* 6, in 2 series. *Petals* 6, in 2 series, with two glands on each near the base. *Stamens* 6; *anthers* dehiscent by ascending valves. *Ovary* 1-celled; style short;

stigma capitate. *Berries* .3-.5 in. long, elliptic or globose, purple, glaucous.

Jaunsar, 6-8,000 ft. Common near Chakrata.

The fruit is eaten.

Fl. Mar., April. Fr. May, June.

To this Family belongs the herbaceous plant, *Podophyllum emodi*, Wall.; Fl. Br. Ind. i. 112. Vern. *Rikkpetā*, Jaunsar. *Pāpra*, Hind.;—the rootstock of which yields the valuable medicine known as Podophylline. *Leaves* 2 or 3, 6-9 in. diam., 3- or more-lobed, margins lacinate and serrate. *Flowers* 1-1.5 in. diam., white or light-rose. *Fruit* ovoid, 1.5-2.5 in. long. Common in shady places above 7,000 ft. in JAUNSAR and TEHRI-GARHWAL.

Nandina domestica, Thunb.—A shrub about 4 ft. high with alternate, tripinnate leaves and terminal panicles of white flowers and red berries is often cultivated in Dehra as an ornamental plant.

Order 2.—PARIETALES.

VII. CAPPARIDACEÆ.

Herbs or shrubs, rarely trees. *Leaves* alternate, simple or palmately 3-9-foliolate. *Flowers* usually bisexual, cruciform, regular or irregular. *Sepals* 4, free or connate. *Petals* generally 4, hypogynous or seated on a disk. *Stamens* 4-8, or indefinite, inserted at the base of a gynophore; filaments slender; anthers versatile. *Ovary* usually long-stipitate, 1-celled; style short or 0; ovules indefinite, on parietal placentas. *Fruit* a berry or a capsule. *Seeds* exalbuminous.

Analysis of the Genera.

Generally climbing or straggling	
shrubs. Leaves simple; petals	
sessile	1. CAPPARIS.
A tree. Leaves trifoliolate; petals	
clawed	2. CRATÆVA.

1. **Capparis**, Linn.

Shrubs, rarely trees, usually with stipulary thorns. *Leaves* simple, sometimes caducous. *Sepals* 4, usually free. *Petals* 4, sessile, imbricate. *Stamens* indefinite; filaments filiform. *Ovary* on a long gynophore; stigma sessile. *Fruit* a fleshy berry; seeds many.

Analysis of the Species.

- | | |
|---------------------------------------|---------------------------|
| Flowers large, solitary, axillary | . 1. <i>C. spinosa</i> |
| Flowers small, umbelled | . 2. <i>C. sepiaria</i> . |
| Flowers large, 2-4 in vertical lines, | |
| supra-axillary | . 3. <i>C. horrida</i> . |

1. **C. spinosa**, Linn.; Fl. Br. Ind. i. 173; Brandis For. Flora 14, Ind. Trees 33; Gamble Man. Ind. Timb. 33. The Caper plant. Vern. *Kiári*, *Báuri*, Jaunsar.

A small trailing shrub; young parts covered with a white or yellowish caducous tomentum; thorns straight or recurved, rarely absent. *Leaves* 1-2 in. long, orbicular or broad-ovate, entire, thick, mucronate, nearly glabrous. *Flowers* 1-3 in. diam., white, fading into purplish red. *Sepals* unequal, concave. *Petals* 1 in. long, clawed, obovate, undulate. *Stamens* numerous, purple, longer than the petals. *Gynophore* as long as the stamens, with glands at the base. *Fruit* 1-3 in. long, red inside when ripe.

On dry hot rocks at low elevations in the HILLS: Tons and Pábar valleys.

"The fruit is pickled, and the leaves and ripe fruit are a favourite food of goats and sheep."—*Sir D. Brandis*.

Fl. May-July. Fr. Cold season.

2. **C. sepiaria**, Linn.; Fl. Br. Ind. i. 177; Brandis For. Flora 15, Ind. Trees 34. Gamble Man. Ind. Timb. 35.

A large climbing shrub with thorny stem and branches. *Leaves* green, very variable, usually 1-2 in. long and ovate. *Flowers* white, .3-.5 in. diam., in sessile or shortly peduncled umbels; pedicels slender, .5-.8 in. long. *Sepals* ovate. *Petals* narrow-oblong. *Ovary* ovoid. *Fruit* .3 in. diam., black, on a short gynophore.

Scrub forests at the foot of the SAHÁRANPUR SIWALIKS, e.g., Barkálá, Kasúmri, Kôtri, Ránipur, etc.

Fl. Rainy season.

3. *C. horrida*, Linn.; Fl. Br. Ind. i. 178; Brandis For. Flora 15 Ind. Trees 35; Gamble Man. Ind. Timb. 36. Vern. *His. Hins, Kalis, Kálhis, Kálhins, Khalis, Dún; Jhiri*, Hind.

A tall scrambling shrub, covered when young with ferruginous caducous tomentum; stem thickly beset with scattered thorns. *Leaves* 4 by 2-5 in. but often much smaller, oblong or ovate, mucronate. *Flowers* 1-5-2 in. diam., white, fading into dull-rose; pedicels .5-1 in. long, 2-4 in a vertical line above the leaf. *Stamens* very numerous, purple. *Fruit* subglobose, 1-1-5 in. diam., on a gynophore 1-5-2 in. long.

Common in scrub forests in the DÚN, and at the base of the SAHÁRANPUR SIWALIKS: Kálsi; Ránipur, etc.

The leaves and twigs are eaten by goats, cattle and elephants.

Fl. Feb.-May. Fr. Aug., Sept.

2. *Cratæva*, Linn.

1. *C. religiosa*, Forst.; Fl. Br. Ind. i. 172; Brandis For. Flora 16; Gamble Man. Ind. Timb. 32. Vern. *Bárna*, Saháranpur.

A moderate-sized deciduous tree; bark grey, fairly smooth, with long horizontal wrinkles. *Leaves* 3-foliolate; petiole 4-6 in. long. *Leaflets* 3-6 by 1-3-3 in., ovate or ovate-lanceolate, acuminate. Entire, glabrous, subcoriaceous, pale beneath; petiolules auriculate. *Flowers* 2-3 in. diam., white, pale-yellow or light-rose, in many flowered lax terminal corymbs. *Sepals* 4, deciduous, *Petals* 4, long-clawed, oblong, ovate or spathulate, 1-1-5 in. long. *Stamens* numerous; filaments slender, free, exceeding the petals. *Ovary* on a long gynophore. *Stigma* sessile. *Fruit* a many-seeded ovoid berry, 1-2 in. diam., rough with white specks; seeds imbedded in a yellow pulp.

Foot of the SAHÁRANPUR SIWALIKS near Bádsháhibágh, Mohand, Beribára, Gaj-Ráu Block, etc. Also Pathri Forest. Rather scarce. Cultivated in gardens for the flowers.

Wood yellowish-white, moderately hard, even-grained; weight about 45 lbs. per c. ft. It is used for drums, models, writing boards, combs, and turnery. The leaves are lopped for cattle and camel fodder.

Fl. April, May.

VIII. BIXACEÆ.

Trees or shrubs. *Leaves* alternate, simple ; stipules minute or 0. *Flowers* regular, 1-2-sexual. *Sepals* 4-5, imbricate, often deciduous. *Petals* 4-5 or 0, caducous. *Stamens* often numerous and hypogynous, opening by pores or slits. *Ovary* generally 1-celled ; ovules parietal, usually numerous. *Fruit* either a dry capsule dehiscent by valves, or a fleshy indehiscent berry. *Seeds* arillate or with a pulpy testa ; albumen copious.

Analysis of the Genera.

- Leaves lobed ; petals large ; fruit a capsule 1. COCHLOSpermum.
 Leaves not lobed ; petals none ;
 fruit indehiscent—
 Styles 2 or more 2. FLACOURTIA.
 Style 1 3. XYLOSMA.

1. *Cochlospermum*, Kunth.

1. *C. Gossypium*, DC.; Fl. Br. Ind. i. 190; Brandis For. Flora 17, Ind. Trees 38; Gamble Man. Ind. Timb. 37. Vern. *Gejrá*, *Arlú* Saháranpur.

A small deciduous tree with short branches and deeply cracked thick bark. *Leaves* palmately 5-lobed, 4-6 in. diam.; lobes acuminate, more or less tomentose beneath ; petioles thick, 6-9 in. long. *Flowers* 2-sexual, 3-4 in. across, in terminal panicles, appearing before the leaves ; peduncle and pedicels covered with grey tomentum. *Sepals* 5, ovate or elliptic, 5 in. long, silky. *Petals* 5, bright-yellow, obovate, 1-2 in. long, with numerous fine parallel veins. *Stamens* numerous, inserted on a disk ; filaments 5·7 in. long, filiform ; anthers opening by a slit at the top or by a pore. *Fruit* a pyriform capsule, 5-valved ; valves 2-3 in. long. *Seeds* kidney-shaped, 2 in. long, covered with soft silky wool.

Common on dry slopes of the OUTER SIWALIKS especially towards Ránipur.

Wood very soft, light and spongy, of no use. A white gum exudes from the bark which is used in country medicine under the name *Katirá*. A very showy tree in the hot season.

Leafless Dec., April. Fl. Mar., April. Fr. June, July.

2. *Flacourtia*, Commers.

Trees or shrubs, generally spinous. *Leaves* crenate. *Flowers* small, usually dioecious. *Sepals* 4-5, small, imbricate. *Petals* none. *Stamens* numerous; anthers versatile. *Ovary* on a glandular disk; styles 2 or more. *Fruit* a berry with many seeds.

Analysis of the Species.

Leaves acuminate; racemes glabrous; fruit large 1. *F. Cataphracta*.

Leaves rounded or obtuse, racemes tomentose; fruit small 2. *F. Ramontchi*.

1. *F. Cataphracta*, Roxb.; Fl. Br. Ind. i. 193; Gamble Man. Ind. Timb. 39; Brandis Ind. Trees 39. Vern. *Pachnáli*, *Jamnuá*, Dún.

A small evergreen tree, bearing compound spines up to middle age; bark smooth. *Leaves* 3-5 in. long, ovate or ovate-lanceolate, long-acuminate, crenate, thin but tough, quite glabrous, shining above; base acute, rarely rounded; petiole .1-.2 in. long. *Flowers* very small, in irregular glabrous racemes; stigmas 4-6. *Fruit* globose, .5-.7 in. diam., crowned by the persistent stigmas on peduncles .3-.5 in. long, very acid, dark-purple when ripe.

Sál forests of the Dún. Common along the banks of the Rénadi, and in other low-lying shady places. Occasionally in the SAHÁRANPUR DISTRICT, e.g., at Dholkhand.

The wood is hard and compact and is used for agricultural implements. The acid fruit is eaten.

Fl. July, Aug. Fr. Nov., Dec.

2. *F. Ramontchi*, L'Herit.; Fl. Br. Ind. i. 193; Brandis For. Flora 18, Ind. Trees 40; Gamble Man. Ind. Timb. 40. Vern. *Kandái*, *Kandei*, Hind.; *Kángo*, E. Dún.

A small thorny deciduous tree with rough whitish-grey bark; young parts tomentose. *Leaves* 2-4 in. long, ovate, obovate or sub-orbicular, obtusely serrate or crenate, glabrous or glabrescent above, usually tomentose beneath; petiole .2-.3 in. long, tomentose. *Flowers* small, greenish-yellow, in short tomentose racemes. *Sepals* rusty-hairy. *Stigmas* 5-11, free or connate. *Fruit* globose, .3-.5 in. diam. subacid, red or dark-brown when ripe; seeds 8-16.

Throughout the FORESTS of the DEHRA DUN DIVISION. Also MUSSOORIE and MÁLKÔT HILLS; at Kálsi, Saiá and in the Tons valley in Jaunsar, up to about 4,000 ft.; most abundant in scrub forests.

The wood is hard and durable, and is used for agricultural implements. The leaves and twigs are lopped for fodder. The fruit is eaten.

Leafless Feb., Mar. Fl. Mar., April. Fr. May, June.

3. *Xylosma*, Forster.

1. *X. longifolium*, Clos.; Fl. Br. Ind. i. 1904; Brandis For. Flora 19, Ind. Trees 40; Gamble Man. Ind. Timb. 18. Vern. *Siálu*, *Kátári*, *Kandhára*, *Dún*; *Phaláma*, Garhwal.

A moderate-sized evergreen tree, thorny when young, propagated chiefly by rootsuckers. *Leaves* 3-6 by 1-2 in., oblong-lanceolate, obtusely serrate, coriaceous, glabrous, shining above when young, deeper green but dull when old; petiole .2-.4 in. long. *Flowers* small, yellow, dioecious, in short dense-flowered axillary panicles; pedicels bracteate. *Petals* none. *Style* 1, short. *Fruit* a 2-8-seeded more or less dry berry, about .2 in. diam.

Common in shady ravines throughout the DÚN, occasionally also in the SAHÁRANPUR-SIWÁLIKS. Also in valleys in the MUSSOORIE and MÁLKÔT HILLS and in JAUNSAR, Lachiwála, Mohkumpur, Karwápáni, Ámbári, Chilláwáli Ráu, etc.

The wood is pinkish, moderately hard and even-grained, used chiefly for fuel and charcoal; weight 55 lbs. per c. ft.

Fl. Nov.-Jan. Fr. Mar.-May.

Order 3.—POLYGALES.

IX. PITTOSPORACEÆ.

Trees or shrubs, sometimes climbing. *Leaves* alternate, rarely subverticillate, usually entire, exstipulate.

Flowers usually 2-sexual. *Sepals* and *petals* 5 each, imbricate. *Stamens* 5, hypogynous, alternating with the petals; anthers versatile. *Ovary* 1-celled with 2-5 parietal placentas; ovules many; style simple; stigma 2-5-lobed. *Fruit* capsular or indehiscent. *Seeds* usually many.

1. *Pittosporum*, Banks.

Trees or shrubs. *Sepals* and *petals* free or connate at the base. *Stamens* erect; filaments subulate. *Ovary* usually 2-valved. *Fruit* a 1-celled, 2-valved capsule. *Seeds* smooth, imbedded in a viscid pulp.

Analysis of the Species.

Leaves, young branches and capsules	
glabrous	1. <i>P. floribundum</i> .
Leaves, young branches and capsules	
tomentose	2. <i>P. eriocarpum</i> .

1. *P. floribundum*, W. & A.: Fl. Br. Ind. i. 199; Brandis For. Flora 19, Ind. Trees 42; Gamble Man. Ind. Timb. 43.

A small handsome tree with a short trunk and spreading branches; bark ash-colour or yellowish-grey, rough with small white specks. *Leaves* 3-6 in. long, lanceolate or elliptic-oblong, acute or acuminate, thinly coriaceous, shining above; margins wavy or obscurely toothed; midrib prominent; lateral nerves faint; petiole .5-.7 in. long. *Flowers* yellowish, numerous, about .3 in. across, in corymbosely branched short terminal panicles. *Sepals* subciliate. *Petals* free, linear-oblong. *Style* persistent. *Capsule* the size of a pea, rugose, yellow when ripe; seeds about 6, in a red pulp.

OUTER HIMALAYA and the DŪX, in shady places or ravines.—Rámgarh, Mohkumpur, Lachiwála, Mothronwála, Karwápáni, Timli Pass, etc.

Wood light-grey, strong and tough, but used only for fuel.

Fl. Jan.-June. Fr. April-Nov.

2. **B. eriocarpum**, Royle; Fl. Br. Ind. i. 199; Brandis For. Flora 19, Ind. Trees 43; Gamble Man. Ind. Timb. 44.

A small tree with spreading branches; young parts brown tomentose. *Leaves* 4-8 in. long, obovate or broadly oblanceolate glabrate above, yellowish-tomentose beneath; petiole .7-1.2 in. long. *Flowers* pale-yellow, .3 in. across, in many-flowered umbellate corymbs. *Sepals* lanceolate, tomentose. *Petals* free, linear. *Capsules* .5 in. diam., felted-tomentose, tipped with the persistent style; valves woody; seeds many.

MUSSOORIE HILLS; above Rájpur in Kiárkuli Forest, also at Sahansra-dhára, 3,600 ft.: Amláwa Valley in JAUNSAE.

Wood used only for fuel.

Fl. Mar., April. Fr. May-July.

Order 4.—CARYOPHYLLALES.

X. TAMARICACEÆ.

Shrubs or small trees. *Leaves* alternate, minute, often scale-like and adpressed on the branches, exstipulate. *Flowers* regular, usually 2-sexual in simple or paniced spikes or racemes. *Sepals* and *petals* often 5 each, imbricate, free or connate below. *Stamens* as many or twice as many as the petals, inserted on a glandular disk; anthers versatile. *Ovary* with 3-5 carpels. *Fruit* a capsule dehiscing into 3-5 valves. *Seeds* hairy or winged.

1. **Tamarix**, Linn.

1. **T. dioica**, Roxb; Fl. Br. Ind. 1. 249; Brandis For. Flora 21, Ind. Trees 46; Gamble Man. Ind. Timb. 46. Vern. *Jháu*, *Lál Jhau*, Hind.

A gregarious shrub: bark reticulately cracked. *Leaves* minute, sheathing, acuminate, green with white margins. *Flowers* usually dioecious, light rose-coloured. *Sepals* and *petals* free; bracts acuminate, with a sheathing base, as long as the flowers. *Stamens* 5, about twice as long as the petals. *Capsules* oblong, .2 in. long.

Along open streams in the DÚN, such as the Sông and Suswà rivers: also in the ráus of the SAHÁRANPUR SIWALIKS, and at Bis-henpur and other places along the Ganges.

Wood red and moderately hard, but used chiefly for fuel. Weight about 50 lbs. per c. ft.

Fl. May-July. Fr. Cold season.

Order 5.—GUTTIFERALES.

XI. HYPERICACEÆ.

Herbs or shrubs. *Leaves* opposite, entire, gland-dotted, exstipulate. *Flowers* regular, 2-sexual, usually cymose, terminal or axillary, generally yellow. *Sepals* usually 5, imbricate. *Petals* as many as the *sepals*, contorted in bud. *Stamens* indefinite, 3-5-adelphous, rarely free or monadelphous; anthers versatile. *Ovary* 1-3-5-celled; ovules numerous, generally on axile placentas; styles 3-5, filiform, united. *Fruit* a septical capsula. *Seeds* numerous, exalbuminous.

1. *Hypericum*, Linn.

Herbs or shrubs. *Leaves* generally sessile. *Flowers* cymose. *Petals* yellow, usually oblique, sometimes gland-dotted.

Analysis of the Species.

Petals rather longer than the
stamens. Styles t vice as long as
the ovary—

Branches terete; flowers 2 in.

diam., sepals ovate . . . 1. *H. cernuum*.

Branches 4-angled; flowers 1-1.5 in.

diam., sepals lanceolate . . . 2. *H. lysimachioides*.

Petals twice as long as the stamens.

Styles not longer than the ovary . 3. *H. patulum*.

1. **H. cernuum**, Roxb.; Fl. Br. Ind. i. 253; Brandis Ind. Trees 48; Gamble Man. Ind. Timb. 48. Vern. *Pingniurá*, *Phiunli*, Jaunsar; *Piuli*, Málköt.

A glabrous shrub; branches terete. *Leaves* 1-3 by .5-1 in., decussate, sessile, elliptic or ovate-lanceolate, entire, minutely dotted, glaucous beneath; tip acute or rounded. *Flowers* 2 in. diam., bright golden-yellow, 3-5 in a short terminal cyme. *Petals* obovate, longer than the stamens. *Styles* .5-.8 in. long, spreading. *Capsules* conical, .3-.5 in. long.

Throughout JAUN SAR and the OUTER HIMALAYA, 5,-8,000 ft., often on rocks.—Korwá, Kathián, Málköt, etc.

Fl. April, May.

2. **H. lysimachioides**, Wall; Fl. Br. Ind. i. 254.

A glabrous shrub 1-3 ft. high; branches quadrangular at least towards the ends. *Leaves* .8-2 in. long, subsessile, ovate or ovate-lanceolate, acute or rather obtuse, glabrous, lower surface, pale-glaucous, black-dotted. *Flowers* 1-1.5 in. diam. in terminal, leafy 2-3-chotomous cymes. *Sepals* narrowly lanceolate, .3-.35 in. long. *Petals* yellow, broadly lanceolate, rather longer than the stamens. *Stamens* in 5 bundles. *Ovary* 5-celled; *styles* 5, longer than the ovary but not exceeding the stamens. *Capsule* about .25 in. long.

Jaunsar and Outer Himalaya, 5,-8,000 ft.

Morla; Jádí; Mussoorie, etc.

Fl. June-Aug.

3. **H. patulum**, Thunb.; Fl. Br. Ind. i. 254; Brandis Ind. Trees 48; Gamble Man. Ind. Timb. 48.

A shrub. *Leaves* distichous, .5-1.5 in. long, narrow-rhomboid or elliptical, very shortly petioled, black-dotted and rusty beneath; margins reflexed. *Flowers* 1 in. diam. *Sepals* .2 in. *Petals* yellow, orbicular or elliptical, twice as long as the stamens. *Styles* equalling the ovary but exceeding the stamens. *Capsules* obtusely conical, .2-.3 in. long.

HILLS of MUSSOORIE and JAUN SAR at 5,-7,000 ft. in shady ravines, sometimes on rocks.

Fl. April, May.

XII. TERNSTRÆMIACEÆ.

Shrubs or trees. *Leaves* alternate, simple, exstipulate, usually coriaceous. *Flowers* regular, generally

showy and 2-sexual, usually subtended by a pair of bracts. *Sepals* and *petals* 5 each, imbricate, the latter sometimes connate below. *Stamens* numerous, hypogynous, free or connate at the base, often adnate to the petals. *Ovary* syncarpous, usually 3-5-celled, rarely many-celled; ovules 2 or many in each cell, on axile placentas; styles as many as the cells, free or connate. *Fruit* a berry or a capsule. *Seeds* few or many; albumen scanty or 0.

Analysis of the Genera.

Erect shrubs or trees.

Leaves smooth, evergreen; flowers white, on simple pedicels.

Flowers small, dioecious; fruit a berry

1. EURYA.

Flowers large, 2-sexual; fruit a capsule

4. CAMELLIA.

Leaves rough, deciduous; flowers usually pink, paniced

3. SAURAUJA.

Climbing shrubs. Flowers white, cymose; fruit a fleshy berry . .

2. ACTINIDIA.

1. *Eurya*, Thunb.

1. *E. acuminata*, DC.; Fl. Br. Ind. i. 285; Gamble Man. Ind. Timb. 64; Brandis Ind. Trees 58. Syn.—*E. japonica*, Thunb. (partly); Brandis For. Flora 24.

An evergreen shrub with brown smooth bark; branchlets terete; young parts generally hairy. *Leaves* 2-4 by 5-8 in., oblong-lanceolate, acuminate, closely orenate-serrulate, coriaceous, usually glabrous above; midrib depressed above, hairy beneath; lateral nerves indistinct; petiole very short. *Flowers* white, small, dioecious, about 5 together in the axils of the leaves; pedicels short, 2-bracteolate. *Sepals* 5, concave, pubescent outside. *Petals* 5, white, alternating with and exceeding the sepals, 1 in. long, more or less united below. *Stamens* 12-15, shorter than the petals. *Fruit*

globose, of the size of a peppercorn, crowned by the remains of the styles.

OUTER HIMALAYA, 3,700 ft.: Málkôt Hills; Mussoorie. Also low valleys in the HILLS, *e.g.*, Bámsu, Kulni, etc.

Wood reddish-brown, close-grained, moderately hard.

Fl. Nov., Dec.

2. *Actinidia*, Lindl.

1. *A. callosa*, Lindl.; Fl. Br. Ind. i. 286; Brandis Ind. Trees 62.

A climbing shrub; stems brown, white-warted. *Leaves* 3-5 by 2-3 in., broadly elliptic, acuminate, serrulate; lateral nerves 6-8 pairs; petiole 1-2·5 in. *Flowers* white, ½ in. diam., polygamous or diœcious in lax umbellate axillary cymes. *Sepals* 5, oblong, obtuse, tomentose. *Petals* 5, contorted-imbricate. *Stamens* many. *Ovary* hairy, many-celled; styles numerous, elongated after flowering. *Fruit* a fleshy ovoid berry, ½ in. long, edible.

Valleys below MUSSOORIE and in DEHRA DÚN. Scarce.

Fl. June. Fr. Sept.

3. *Saurauja*, Willd.

1. *S. napaulensis*, DC.; Fl. Br. Ind. i. 286; Brandis For. Flora 25, Ind. Trees 62; Gamble Man. Ind. Timb. 65. Vern. *Ratendù*, Jaunsar; *Goginá*, Hind.

A small tree sparingly branched; bark reddish-brown; young parts and inflorescence covered with long tapering stiff brown hairs. *Leaves* approximate at the ends of the branches, 7-14 by 2·5-4 in., oblong or oblanceolate, acute or short-acuminate, acutely serrate, rusty-tomentose beneath, especially when young; lateral nerves numerous, parallel, prominent; petiole 1-1·5 in., rough. *Flowers* pink, ½ in. diam., in lax drooping axillary panicles; bracts imbricate. *Sepals* small, fleshy. *Petals* pink, usually connate at the base; margins fimbriate. *Stamens* many; anthers dehiscing by pores. *Fruit* fleshy, green, 5-lobed, with a mealy sweet pulp. *Seeds* reddish-brown, small.

Damp valleys in the HILLS, 3,500 ft.; Mayargádh below Jádi, Garugádh in the Tons Valley, Sansáru Khálá, etc.

Wood light-pink, soft, spongy. The ripe fruit is eaten.

Fl. April, May. Fr. May, June.

4. *Camellia*, Linn.

1. *C. Thea*, Link.; Brandis For. Flora 25, Ind. Trees 61 ; Gamble Man. Ind. Timb. 68 ; Syn.—*C. theifera*, Griff.; Fl. Br. Ind. i. 292. The Tea plant. Vern. *Chá* or *Cháh*, Hind.

A large evergreen shrub. *Leaves* 3-6 by 1-2.5 in., elliptic-oblong, acute or acuminate, serrate, usually coriaceous, glabrous above, slightly pubescent along the nerves beneath ; petiole .15 in. *Flowers* 1-1.5 in. diam., axillary, solitary or a few together on short peduncles ; bracts 2-3, sepal-like. *Sepals* 5, leathery, concave, more or less pubescent, edges ciliate. *Petals* white, .5-.7 in. long, broadly obovate, slightly coherent at the base. *Stamens* numerous, cohering at the base, adherent to the base of the petals. *Ovary* 3-5-celled. *Fruit* a loculicidal capsule, .7-.9 in. diam., leathery ; seeds few, pale-brown.

Largely cultivated in plantations in the DŨN. The wood is moderately hard and close- and even-grained. Straight branches of unpruned shrubs make very good walking sticks.

Fl. Dec.-Mar. Fr. Sept.-Dec.

XIII. DIPTEROCARPACEÆ.

Usually resinous trees. *Leaves* alternate, simple, entire, penninerved ; stipules usually small and early deciduous. *Flowers* regular, 2-sexual, in panicles. *Calyx* gamosepalous, campanulate, free or adnate to the ovary, 5-lobed ; 2 or more of the lobes usually accrescent in fruit forming wings. *Petals* 5, twisted. *Stamens* 5-15 or indefinite, hypo- or perigynous, free, connate or adnate to the petals ; anthers with an aristate connective. *Ovary* slightly immersed in the torus, usually 3-celled. *Fruit* capsular or nut-like,

usually winged with the variously enlarged calyx-lobes. Seed usually exalbuminous ; cotyledons fleshy.

1. *Shorea*, Roxb.

1. *S. robusta*, Gærtn.: Fl. Br. Ind. i. 306 ; Brandis For. Flora 26, Ind. Trees 69 ; Gamble Man. Ind. Timb. 77. The Sál tree, Vern. *Sál*, Hind.

A large tree, deciduous but seldom quite leafless ; bark of young trees blackish-brown, smooth or with a few longitudinal cracks, marked with minute grey specks ; of old trees very thick, dark-grey, rough with irregular furrows. Leaves 4-12 by 2-7 in., ovate-oblong, acuminate, tough, thinly coriaceous, glabrous and shining when fully mature ; lateral nerves 12-15 pairs, those near the apex very slender ; base cordate or rounded ; petiole terete, .5-8 in. long ; stipules .3 in. long, pubescent, caducous. Flowers subsessile, in large lax terminal or axillary racemose panicles, covered with white pubescence. Calyx-tube short, adnate to the torus ; segments ovate, all accrescent in fruit. Petals pale-yellow, about .5 in. long, narrow-oblong or lanceolate, much exceeding the calyx-segments in flower. Stamens up to 50, many times shorter than the petals ; connective subulate, bearded, minutely trifid at the apex. Ovary 3-celled ; style subulate. Fruit .5 in. long, ovoid, acute, rather fleshy, indehiscent, white-pubescent ; wings 5, 2-3 in. long, spathulate, narrowed at the base, brown when dry, somewhat unequal, with 10-12 straight parallel nerves.

The principal tree of the DEHRA DU · DIVISION ascending to 4,000 ft. in the OUTER HILLS of MALKÔT, MUSSOORIE and JAUNSAR, everywhere most remarkably gregarious. "In the NEPAL TERAI, the sál tree attains 100-150 ft. with a clear stem to the first branch of 60-80 ft., and a girth of 20-25 ft."—*Sir D. Brandis*. Within the limits of this Flora, however, it is seldom more than 80 ft. in height and 6 ft. in girth, unless hollow inside. The sapwood is whitish, not durable. The heartwood is brown, cross-grained, hard, and very durable ; weight when fully seasoned 50-60 lbs. per c. ft. It seasons very badly and warps and splits in drying. For building purposes, however, it is the strongest and most important timber of Northern India. The tree yields, when tapped, a large quantity of a white opaline resin which is burnt as an incense, being considered indispensable as such in certain Hindu religious ceremonies, and is also used to caulk boats and ships. An oil is extracted from the fruit, which is used for burning and to

adulterate ghee. The fruit is also ground into flour and eaten by the poorer classes during times of scarcity.

New leaves and Fl. Mar., April. Fr. May-July.

Order 6.—MALVALES.

XIV. MALVACEÆ.

Herbs, shrubs or soft-wooded trees; bark with mucilaginous juice and tenacious fibre; young parts mostly covered with stellate hairs. *Leaves* alternate, stipulate, simple, lobed, or digitately compound, usually palm-nerved. *Bracteoles* 3 or more, often forming an epicalyx. *Flowers* regular, generally 2-sexual, axillary or terminal, solitary fascicled or cymosely paniced. *Sepals* 5, more or less connate, valvate in bud. *Petals* 5, hypogynous, twistedly imbricate. *Stamens* generally indefinite, monadelphous, rarely pentadelphous; anthers 1-celled, bursting longitudinally. *Ovary* syncarpous; carpels generally numerous; ovules attached to the inner angle of each carpel. *Styles* more or less connate; stigma various. *Fruit* a loculicidal capsule, or of dry cocci. *Seeds* sometimes with silky tubular hairs well-known as cotton; albumen scanty or 0.

Analysis of the Genera.

Staminal-tube entire, or slightly divided
at the apex. Herbs or shrubs.

Fruit composed of several carpels
separating from the axis.

Styles as many as carpels.

Carpels 1-seeded.

Bracteoles 3	1. MALVASTRUM.
Bracteoles 0	2. SIDA.

Carpels 2-or more-seeded.		
Bracteoles 0	3.	ABUTILON.
Styles twice as many as carpels.		
Bracteoles 5	4.	URENA.
Fruit capsular.		
Stigmas spreading	5.	HIBISCUS.
Stigmas coherent into a club-shaped mass	6.	THESPESIA.
Staminal-tube dividing into 5 bundles of stamens. Trees.		
Leaves simple	7.	KYDIA.
Leaves digitate	8.	BOMBAX.

1. *Malvastrum*, A. Gray.

M. coromandelianum, Garcke; Syn.—*M. tricuspidatum*, A. Gray; Fl. Br. Ind. i. 321.

An undershrub 2-3 ft. high, strigose-pubescent, branched. *Leaves* 8-3 in. long, ovate to oblong-ovate, acute, irregularly serrate, sparsely hairy on both surfaces, the hairs of the upper surface mostly simple; *petiole* 3-1 in., densely adpressed hairy; *stipules* 2 in. long, linear, strigose. *Flowers* mostly solitary in the axils, on peduncles shorter than the petioles; *bracteoles* 3, linear. *Calyx* campanulate, 5-lobed; lobes triangular, acute, longer than the calyx-tube. *Petals* pale yellow, somewhat longer than the calyx. *Carpels* 8-12, reniform, hirsute on the top, with 3 beaks, one near the inflexed apex, and 2 on the back.

A common weed of waste grounds and cultivated soils.

2. *Sida*, Linn.

Herbs or undershrubs with stellate pubescence. *Leaves* simple, toothed. *Flowers* pedicellate; axillary, solitary or clustered, the pedicels jointed; bracteoles 0. *Sepals* 5, valvate, connate into a broad tube below. *Corolla* of 5 petals, yellow or white; petals connate below and adnate to the staminal-tube. *Staminal-tube* divided at the top into numerous antheriferous filaments. *Carpels* 5 or more, 1-ovuled. *Styles* as

many as carpels. *Ripe carpels* separating from the axis. generally 2-awned at the apex.

Analysis of the Species.

Carpels 5.

- | | |
|---|------------------------------|
| Peduncles jointed near the flower ;
petioles with small spiny tubercles
at the base | 1. <i>S. spinosa</i> . |
| Peduncles jointed about half way ;
petioles without spiny tubercles at
the base | 2. <i>S. veronicæfolia</i> . |

Carpels 6-10 (sometimes 5 in *S. acuta*).

Awns shorter than the calyx.

- | | |
|---|----------------------------|
| Leaves lanceolate, glabrous or nearly
so ; peduncles mostly as short as
the petioles | 3. <i>S. acuta</i> . |
| Leaves rhomboid-lanceolate or
obovate, hoary beneath ; ped-
uncles longer than the petioles | 4. <i>S. rhombifolia</i> . |
| Awns exceeding the calyx | 5. <i>S. cordifolia</i> . |

1. *S. spinosa*, Linn.; Fl. Br. Ind. i. 323, Vern. *Bariara*.

A small erect undershrub, grey from minute stellate hairs. *Leaves* 1.5-2 in. long, very variable, ovate to oblong-lanceolate, crenate-serrate, rounded or narrowed at the apex, or sub-cuneate to rounded and subcordate at the base, 3-nerved, ultimately glabrate above, grey-pubescent beneath ; *petiole* 1.5-1 in. long, with often 1-3 small spiny tubercles at the base. *Stipules* subulate. *Flowers* axillary, solitary or fascicled on short shoots, usually pale-yellow. *Peduncles* jointed near the flower about equalling the petioles. *Calyx-teeth* triangular, acute, grey-pubescent. *Carpels* 5, equalling the calyx, with 2 short hairy beaks.

Waste places and roadsides ; not common.

Fl. May-Sept.

2. *S. veronicæfolia*, Lamk ; Syn. *S. humilis*, Willd.; Fl. Br. Ind. i. 322. Vern. *Kharenti*.

A perennial much-branched herb or undershrub ; branches trailing, hairy with long spreading hairs as well as stellate ones. *Leaves* 1.5-2.5 in. long, ovate, cordate, acuminate, crenate-serrate, membranous, sparsely clothed with stellate hairs ; *petiole* slender,

·5-1 in. long, hairy. *Peduncles*, slender, axillary, solitary or in pairs, jointed about half way. *Calyx* ·16 in. long, 5-angled, hairy; lobes triangular acute or acuminate. *Petals* pale-yellow, lightly exceeding the calyx. *Carpels* 5, smooth, not reticulated, blunt or with a small slightly 2-lipped beak.

In waste places and as an undergrowth in scrub forest.

The leaves are used in medicine.

Fl. Aug.-Oct.

3. *Sida acuta*, Burm.; Syn. *S. carpinifolia* Linn. f.; Fl. Br. Ind. i. 323. Vern. *Kharenti*.

An erect undershrub, about 2-3 ft. high; branches slender, sparsely stellate-hairy. *Leaves* 1-2·5 in. long, lanceolate, serrate or crenate-serrate, acute at the apex, rounded at the base, glabrous above, pale-green and sometimes minutely tomentose beneath when young, ultimately glabrous; *petiole* upto ·25 in. long; *stipules* linear-subulate, exceeding the petioles. *Peduncles* 1-2 in each axil, equalling the petiole, jointed about the middle. *Calyx* ·25-·3 in. long; lobes triangular, acute. *Corolla* yellow, nearly twice as long as the calyx. *Carpels* 5-9, rugose, strongly reticulate, shortly 2-aristate.

Waste ground and scrub forest. The stem yields a good fibre and various parts of the plant are used medicinally.

Fl. Sept.-Nov.

4. *S. rhombifolia*, Linn.; Fl. Br. Ind. i. 323. Vern. *Bariara*; *Kharenti*, Hind.

A small erect undershrub with stellate hairs on the branches. *Leaves* 1-2 in. long, very variable in shape, narrowly or broadly rhomboid or obovate, glabrous or nearly so above, stellate-pubescent or tomentose beneath, entire towards the base, dentate-serrate towards the tip, 3-nerved at the cuneate base; *petiole* upto ·25 in. long. *Peduncles* axillary, or clustered at the ends of the branches, slender, jointed at or below the middle, the lower far exceeding the petioles. *Calyx* 5-angled; lobes deltoid, acuminate. *Corolla* yellow or white. *Carpels* 8-10, awns 2, short

Var. *rhomboidea* (sp. Roxb.). *Leaves* rhomboid-lanceolate, serrate. *Peduncles* more than half the length of the leaves, jointed at the base.

Var. *obovata* (sp. Wall.). *Leaves* broadly obovate, hoary beneath, apex coarsely toothed, base cuneate. *Peduncles* mostly less than half the length of the leaves, jointed above the middle.

Common in waste ground, roadside, etc., upto 4,000 ft.

5. *S. cordifolia*, L.; Fl. Br. Ind. i. 324. Vern. *Kharenti*.

An erect undershrub 2-4 ft. high, stellate-tomentose and with thin spreading hairs on the stem. *Leaves* 1-2 in. long, ovate or ovate-oblong, cordate, obtuse or subacute, crenate, downy on both surfaces; *petiole* .5-1.5 in. long. *Peduncles* axillary, solitary or few together, the lower distant and longer than the petioles, upper short and crowded, jointed much above the middle. *Calyx* .25-.3 in long, grey pubescent; lobes ovate, acute. *Corolla* yellow, slightly exceeding the calyx. *Carpels* 8-10, each with 2 linear, retrorsely hispid awns, nearly as long as the carpels.

A fairly common weed in waste places and scrub jungles.

Fl. Aug.-Oct.

3. *Abutilon*, Tournef.

Tomentose shrubs or herbs. *Leaves* usually cordate and long-petioled, toothed or slightly lobed. *Flowers* solitary, on axillary peduncles (uppermost sometimes running into a raceme in *A. polyandrum* etc.), jointed near the top, yellow or orange; *bracteoles* 0. *Calyx* 5-cleft. *Corolla* of 5 imbricate petals connate below and adnate to the staminal-tube which is divided at the apex into numerous antheriferous filaments. *Carpels* 5-many; *styles* as many as the carpels; *stigmas* small, capitate. *Ripe carpels* separating from the short central axis, dehiscent, usually acute or mucronate, 2-5-seeded. *Seeds* reniform.

Analysis of the Species.

Carpels more than 10, usually 15-20 1. *A. indicum*.

Carpels less than 10, usually 5-6 2. *A. polyandrum*

1. *A. indicum*, Sweet; Fl. Br. Ind. i. 326. Vern. *Tepári*. *Kanghi*.

A small shrub, sometimes only an undershrub, covered with a minutely hoary tomentum. *Leaves* upto 3 in. long, broadly ovate, cordate, acuminate, irregularly and coarsely toothed, softly minutely

hoary-tomentose on both surfaces; *petioles* about three-fourths as long as the blade. *Flowers* solitary, on axillary peduncles, longer than the *petioles*, jointed near the top, yellow, about 1 in. in diameter. *Carpels* 15-20, longer than the calyx, with a distinct, small, acute point, tomentose at first, afterwards sub-glabrous.

A weed of roadside, waste places, etc. It yields a good fibre.

Flowers and fruits during the greater part of the year.

2. **A. polyandrum**, W. & A.; Fl. Br. Ind. i. 325. Vern. *Tepari*.

A suffruticose herb 5-6 ft. high, younger portions densely pubescent. *Leaves* 4-5 in., ovate, cordate, acuminate, irregularly toothed, densely pubescent especially beneath; *petiole* upto 4 in. long. *Flowers* 1.5 in. diam., orange-yellow, in loose panicles; *peduncles* jointed near the top. *Calyx-lobes* .5 in. long, lanceolate, tomentose. *Staminal-tube* very short, densely hairy at the top. *Carpels* usually 5-6, hispid, shortly awned.

A weed of roadside, waste places, etc. The stems yield a silky fibre resembling hemp (Duthie).

Fl. Sept.-Dec.

4. **Urena**, Linn.

U. lobata, Linn.; Fl. Br. Ind. i. 329. Vern. *Unga*, Dun.

An undershrub 2-4 ft. high, tomentose, hairs stellate, spreading. *Leaves* variable, roundish or ovate, angled or shallowly 5-7-lobed, often broader than long, cordate at the base, tomentose on both surfaces, paler beneath; basal nerves 5-7, prominent on the under surface, the 3 central or the midrib only provided with a gland beneath; *petiole* usually shorter than the blade. *Stipules* linear. *Flowers* in axillary clusters sometimes forming more or less leafless terminal racemes; *pedicels* very short hairy. *Bracteoles* 5, equalling or slightly exceeding the calyx, linear-oblong, acute, united at the base into a cup, clothed with rigid hairs. *Calyx* deeply divided, lobes about .2 in. long, lanceolate, ciliate. *Corolla* bright pink with a dark centre, .65 in. long. *Stamens* monadelphous; *anthers* nearly sessile on the staminal tube. *Carpels* 5, with one ovule in each carpel; *styles* 10; *stigmas* capitate. *Ripe carpels* densely pubescent, echinate, separating from the axis, rounded on the back.

Throughout the area, ascending to 5,000 ft. Common in coppice areas and road sides.

The stem gives a useful fibre.

Fl. July-Nov.

5. *Hibiscus*, Linn.

1. *H. pungens*, Roxb.; Fl. Br. Ind. i. 341.

A stout erect bristly shrubby perennial 6-12 ft. high; stems hollow, often with scattered black spots. *Leaves* 5-10 in. diam., roundish cordate, deeply palmately 7-lobed; lobes oblong, lanceolate, acuminate, serrate, upper ones 3-lobed; *petiole* 8-10 in. long, the lower usually exceeding the blade. *Flowers* in terminal racemes upto 12 in. or so in length; *Pedicels* 1-1.75 in. long, *bracteoles* 4-5, lanceolate, acuminate, persistent, shorter than the capsule. *Calyx* 5-lobed. *Corolla* yellow with a purple centre, 5 in. diam. Stigmas spreading. *Capsule* loculicidal, 1.5-2.25 in. long, oblong acuminate, hispid.

Common in forest-glades and shady places in the Dun, ascending to 5,000 ft. in the hills. Nalapani; Bindal, Khala, Raipur, etc.

Fl. May-July.

The following species are commonly cultivated and deserve mention:—

7. *Hibiscus Rosa-sinensis*, Linn.; Fl. Br. Ind. i. 344. The shoe flower. An ornamental evergreen shrub. *Leaves* 3-4 in. long, ovate or ovate-lanceolate, more or less acuminate, coarsely serrate, glabrous and shining, 3-nerved at the base. *Peduncles* axillary, solitary, about as long as the leaves; *bracteoles* 5-7, lanceolate, connate at the base and shorter than the calyx. *Calyx* campanulate divided almost to the middle into 5 lanceolate lobes. *Corolla* about 4 in. diam. *Staminal-tube* exerted far beyond the petals.

There are several varieties with single and double flowers varying in colour from crimson to red and pale-salmon.

Fl. most part of the year.

2. *Hibiscus syriacus*, Linn.; Fl. Br. Ind. i. 344. A small shrub. *Leaves* 5-2 in. long, the lower subrhomboid or ovate, the upper more or less 3-lobed, dentate or coarsely crenate, nearly or quite glabrous, cuneate at the 3-nerved base, *petiole* 3-1 in. long. *Peduncles* axillary, short; *bracteoles* 6-8, linear. *Corolla* lilac with a purple eye, about 2 in. diameter.

3. *Hibiscus mutabilis*, Linn.; Fl. Br. Ind. i. 344. Vern. *Gul-i-ajab*, Hind. A large shrub or small tree. *Leaves* 4-9 in.

diam., suborbicular, cordate, 5-7-lobed or angled, irregularly crenate-dentate, often entire near the base more or less softly pubescent or tomentose; *petioles* 2-6 in. long or longer. *Peduncles* axillary, solitary, subcorymbose at the ends of the shoots, 3-5 in. long; *bracteoles* 7-10, linear-lanceolate, shorter than the calyx. *Calyx-lobes* ovate, acuminate, velvety-pubescent. *Corolla* 3-4 in. diameter, white or light pink in the morning, turning red before night, often double. *Staminal-tube* shorter than the corolla. *Capsules* subglobose, hairy.

Fl. Sept.-Nov.

4. *Hibiscus schizopetalus*, Hook. f. An evergreen shrub rather sarmentose. *Leaves* 1-2 in. long, ovate-lanceolate to elliptic, crenate-serrate except at the base; *petiole* 3-5 in. long. *Flowers* axillary, drooping on long slender peduncles, jointed about the middle. *Bracteoles* minute, subulate. *Calyx* spathaceous, 2-lobed. *Petals* red, deeply lacinate and reflexed. *Staminal-column* long, filiform, pendulous.

Fl. May-Sept.

6. *Thespesia*, Soland.

1. *T. Lampas*, Dalz. & Gibs.; Fl. Br. Ind. i. 345. Brandis Ind. Trees 76; Gamble Man. Ind. Timb. 88. Vern. *Ban Kapasi*, Dunn.

An erect shrub 3-5 ft. high, covered in its herbaceous portions with fine stellate down. *Leaves* 3-6 in. long, cordate, palmately 3-lobed, rarely entire, lobes triangular, acuminate, sparingly stellate-pilose above, tomentose beneath, midrib with a glandular pore at the base beneath; *petiole* 2-4 in. long, downy. *Peduncles* 2-5 in. long axillary rarely terminal, 1-3 flowered; *pedicels* 2-5 in. long; *bracteoles* 5-8, small, subulate, fugacious. *Calyx* cup-shaped, 5-lobed; lobes pointed. *Corolla* 3-3.5 in. diameter, bright yellow with a crimson centre. *Stamens* monadelphous; *staminal-tube* 5-toothed at the apex. *Ovary* 4-5-celled; style club-shaped, 5-furrowed. *Capsule* ovoid, pointed, 1 in. long, girt at the base by the calyx-tube.

Common in glades in Sal forests upto 3,000 ft.

The plants yields a strong, white fibre.

Fl. Aug.-Oct.

7. *Kydia*, Roxb.

1. *K. calycina*, Roxb.; Fl. Br. Ind. i. 348; Brandis For. Flora 29, Ind. Trees 78; Gamble Man. Ind. Timb. 89. Vern. *Pálá*, *Páli*, *Páli*, Hind.

A moderate-sized deciduous tree; bark grey, exfoliating in long strips, rough with large white specks on branches; young parts covered with grey stellate hairs. *Leaves* 4-6 in. diam., rounded, cordate, palmately 5-7 nerved, generally with as many lobes or angles as nerves, glabrate or with scattered hairs above, downy and pale beneath; petiole about half the length of the blade. *Flowers* 5-7 in. across, polygamous, generally dioecious, in much-branched axillary or terminal panicles. *Bracteoles* 4-6, accrescent and spreading in fruit. *Calyx* campanulate, 5-lobed, accrescent. *Petals* white, clawed, adnate to the staminal tube, longer than the calyx. *Stamens* monadelphous; the tube shorter than the petals and split half way into 5 segments, each bearing at the apex 3-5 sessile anthers. *Carpels* 3; style 3-cleft. *Capsule* subglobose, 3-valved; seeds reniform, furrowed.

Very common in the DÚN and SAHÁRANPUR FORESTS, also in valleys in the HILLS at low elevations.

Wood white, soft, used only for fuel; weight 40-45 lbs. per c. ft. The tree is of little value except as a help to reproduction in blanks and glades. The bark is often used for tying up bundles of faggot in the forest. "In North India it is employed for the clarification of sugar."—*Sir D. Brandis*.

Leafless Feb.-April. Fl. July-Oct. Fr. Dec.-Feb.

8. *Bombax*, Linn.

1. *B. malabaricum*, DC.; Fl. Br. Ind. i. 349; Brandis For. Flora 30, Ind. Trees 77; Camble Man. Ind. Timb. 90. The Silk-cotton tree. Vern. *Simal*, *Semul*, Hind.

A large deciduous tree. *Stem* straight, more or less buttressed at the base when old, covered with large conical prickles when young; branches whorled, horizontally spreading. *Leaves* digitate; common petiole 6-12 in. long. *Leaflets* 5-7, 6-9 by 3-5 in., lanceolate oblanceolate or obovate, acuminate, entire, more or less coriaceous, glabrous; petiolule 1 in. long; stipules small, caducous. *Flowers* 4-5 in. across, fleshy. *Calyx* very fleshy, cup-shaped, bright silky-hairy inside. *Petals* crimson or orange, 3-6 in. long, oblong, white-tomentose outside. *Stamens* usually 5-adelphous; filaments numerous, the innermost forked. *Ovary* 5-celled; style 5-lobed at the apex. *Capsule* 5-7 in. long, oblong-ovoid, 5-angled. *Seeds* obovate, smooth, surrounded by long white silky hairs.

Common in the DÚN and SAHÁRANPUR DISTRICTS ascending to 4,000 ft. in the OUTER HIMALAYA and in valleys in the HILLS, generally affecting water-logged places, e.g., the Pathri Forest,

SAHÁRANPUR DISTRICT, and Nakraunda, Jogiwála, and dry beds of the Sông in the Dún.

The wood is very soft and perishable, but durable under water; weight 17.32 lbs. per c. ft. It is used for planking, packing cases, toys, well-curbs and water-shoots. The calyx of flowers not yet fully open is eaten cooked as a vegetable. The cotton is used to stuff pillows and cushions. The seed is valued as a nourishing food for cattle which also greedily devour the flowers. The roots of saplings are used as a nervine tonic in Indian medical practice.

Fl. Jan.-Mar. Fr. April, May.

XV. STERCULIACEÆ.

Herbs, shrubs or trees, usually with soft wood; young parts generally tomentose; bark mucilaginous and with strong fibres. *Leaves* alternate, simple and lobed, or digitate, usually stipulate. *Flowers* generally regular, 1- or 2-sexual or polygamous, often bracteate, in axillary or terminal cymes or panicles, rarely solitary or fascicled. *Calyx* usually gamosepalous; segments 5. *Petals* 5 or none. *Stamens* usually monadelphous, with 5, 10, or 15 2-celled extrorse anthers. *Ovary* stipitate or sessile, free, 2-5-celled, apocarpous or syncarpous. *Fruit* a loculicidal capsule, or of distinct follicular carpels. *Seeds* attached to the inner angle of the carpels, sometimes arillate.

Analysis of the Genera.

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| Flowers 1-sexual or polygamous;
petals none; (fruit of distinct
carpels) | 1. STERCULIA. |
| Flowers 2-sexual; petals 5, deciduous.
Ovary long-stipitate; fruit of distinct
twisted carpels | 2. HELICTERES. |
| Ovary on a short gynophore; fruit
a 5-valved capsule | 3. PTEROSPERMUM |

1. *Sterculia*, Linn.

Trees or shrubs. *Leaves* simple and lobed, or digitate. *Flowers* polygamous. *Calyx* tubular, often coloured. *Staminal column* bearing a ring of sessile anthers. *Carpels* 5, more or less distinct and follicular, usually on a long gynophore, opening long before ripening. *Seeds* one or more in each carpel, often winged or arillate.

Analysis of the Species.

Leaves sharply lobed; foli- woody	1. <i>S. villosa</i> .
Leaves obscurely lobed; foli- membranous	2. <i>S. pallens</i> .

1. ***S. villosa***, Roxb.; Fl. Br. Ind. 1:355; Brandies For. Flora 32, Ind. Trees 80; Gamble Man. Ind. Timb. 91. Vern. *Godgudālā*, Hind.

A moderate-sized deciduous tree with grey bark; branches few, spreading; branchlets stout. *Leaves* approximate at the ends of the branches, 9-18 in. diam., cordate, nearly glabrous above, tomentose beneath, deeply 5-7-lobed; lobes ovate-oblong, acuminate, entire toothed or cleft; petiole 12-24 in. long, hollow, downy outside; stipules lanceolate, deciduous. *Flowers* yellow, in much-branched rusty-pubescent drooping panicles which are crowded at the ends of the leafless branches; male flowers the most numerous; bracts linear, caducous. *Calyx* campanulate, pinkish within, downy outside. *Anthers* inserted on a membranous ring which is adnate to the short gynophore. *Ovary* globose. *Fruit* follicular; follicles 1.5-2.5 in. long, oblong, spreading, coriaceous, rusty-villous, red within; seeds black.

Fairly common in the DÚN and SAHÁRANPUR FORESTS, also at Kálsi, generally on sandy or gravelly soil.

Wood very soft and light, about 20 lbs. per c. ft., of no use. The inner bark yields a coarse strong fibre which is made into ropes and is used, either twisted or in broad bands, in dragging timber. A white clear gum exudes from cuts made in the bark which is used medicinally, and is sold in the bazaar under the name of *katila*.

Leafless Jan.-May. Fl. Mar., April. Fr. June, July.

2. *S. pallens*, Wall.; Sir G. King's Flora of the Malayan Peninsula 182; Brandis Ind. Trees 84; Gamble Man. Ind. Timb. 96. Syn.—*S. fulgens*, Wall. (partly), Fl. Br. Ind. i. 360; Vern. *Khardāla*, Málkôt.

A middle-sized tree with yellowish grey smooth bark. *Leaves* 8-12 in. diam., obscurely lobed, coriaceous, scabrid above, covered with dense pale-yellow stellate tomentum beneath; petiole 8-15 in. long, pubescent. *Flowers* 5-7 in., in erect panicles, pale-yellow, very downy all over, caducous. *Calyx* tubular, curved; teeth ovate, acute. *Follicles* membranous, stipitate, opening long before maturity.

MÁLKÔT HILLS, below MUSSOORIE, Tháno Forest in the DÚN, and Saia in JAUNSAIR;—2,200 to 5,000 ft. Also in shady ravines in the SIWALIKS, e.g., Timli and Mohand Passes.

Economic uses similar to those of *S. villosa*.

Fl. Mar., April. Fr. May, June.

S. alata, Roxb.; Fl. Br. Ind. i. 360; Brandis Ind. Trees 83.

A large tree with smooth grey bark and broadly ovate, cordate, entire glabrous leaves 4-10 in. long; flowers in short rusty tomentose racemes, follicles woody nearly globose, about 5 in. diam., is cultivated as an ornamental tree and is sometimes planted in avenues. It is a native of Assam, Chittagong and lower Burma.

2. *Helicteres*, Linn.

✓ 1. *H. Isora*, Linn.; Fl. Br. Ind. i. 365; Brandis For. Flora 34, Ind. Trees 88; Gamble Man. Ind. Timb. 99. Vern. *Maror-phal*, Hind.; *Kapási*, Saháranpur.

A shrub with thin spreading branches and grey bark; young parts covered with stellate hairs. *Leaves* 3-6 by 2-4 in., bifarious, broad-obovate or orbicular, often lobed, obliquely cordate or rounded at the base, short-acuminate, irregularly toothed, scabrous above, pubescent beneath; petiole 2-4 in. *Flowers* 1-2 in. long, axillary, usually 2 or 4 together, bracteate; pedicels 2-5 in. *Calyx* tubular, 6-8 in. long, indistinctly 2-lipped, brown-floccose outside. *Petals* 5, scarlet, clawed, twice the length of the calyx, reflexed, the two lower ones much larger than the rest; claws winged. *Staminal column* adnate to the gynophore; anthers 10, on short filaments; staminodes 5, scale-like. *Ovary* 5-celled, on a gynophore which is elongated in fruit; styles 5, much exserted, more or less connate. *Fruit* 1.5-2 in. long, cylindrical, pubescent, composed of 5 spirally twisted carpels; seeds tubercled.

A very common shrub in the DÚN and SAHÁRANPUR FORESTS, especially in coppice areas, generally gregarious; rather scarce in Sál forests.

The branches are used for fencing and thatch-frames, and the bark yields a strong white fibre. The fruit and leaves are used in Indian medicine.

Fl. April-Aug. Fr. Cold season.

3. *Pterospermum*, Schreb.

1. *P. acerifolium*, Willd.; Fl. Br. Ind. i. 368; Brandis For. Flora 35, Ind. Trees 91; Gamble Man. Ind. Timb. 100. Vern. *Máyeng*, Jaunsar, *Kanakchampa*, Hind.

A large tree with thin grey smooth bark; young branches covered with ferruginous tomentum. *Leaves* 6-12 by 5-10 in., roundish or oblong, often lobed, entire or remotely toothed, deeply cordate or peltate, coriaceous, glabrous and deep-green above, grey-tomentose and strongly reticulate beneath, palmately 8-10-nerved from the tip of the petiole; lateral nerves 4-6 pairs; petiole 3-6 in. long, striate; stipules multifid, caducous. *Flowers* axillary, solitary or in 2-3-flowered cymes, 5-6 in. diam., fragrant, bracteate; pedicels 5 in. long. *Calyx* 5-cleft; segments valvate, 3-5 by .3-.5 in., linear, very fleshy, floccosely brown-tomentose outside, villous within. *Petals* twistedly imbricate, linear, pure white, slightly shorter than the calyx, membranous, deciduous. *Filaments* 15, 1-1.5 in. long, filiform, in threes opposite to each sepal, with a staminode 2-3 in. long between; the whole staminal whorl forming a tube about 1 in. long below the ovary and adnate to the short gynophore; anthers 15; cells linear, .5 in. long. *Ovary* oblong, 5-angled, inserted on the top of the staminal column; style undivided, club-shaped. *Fruit* a capsule, 4-6 in. long, 5-celled, 5-angled, woody, dark-brown, tomentose. *Seeds* compressed, with large brown membranous wings.

Banks of the Jumná from below Mussoorie to its junction with the Tons, and the Ámláwa valley up to near Sáiá. Very common in the swampy forests of the EASTERN DÚN about Khairi and Sidhárwála. Frequently cultivated in DEHRA.

Growth quick. Sapwood white; heartwood soft or moderately hard, red; weight about 48 lbs. per c. ft. The leaves are lopped for cattle-fodder, and are laid on roofs underneath thatch or slate in Jaunsar; the down of the leaves is used for tinder and to stop bleeding from wounds. A plaster made of the calyx is considered infallible in glandular swellings about the neck and ears.

Fl. Mar.-June. Fr. Cold season.

P. lanceefolium, Roxb.; Fl. Br. Ind. i. 368; is a handsome tree cultivated in gardens at DEHRA, and is found wild in the hills of Assam. *Leaves* lanceolate. *Flowers* 1.5 in. long. *Fruit* 2-3 in. long, woody.

XVI. TILIACEÆ.

Trees, shrubs, or herbs; bark usually mucilaginous and with strong fibres. *Leaves* usually alternate, simple or lobed; stipules free. *Flowers* regular, generally bisexual. *Sepals* 3-5, free or connate, valvate. *Petals* as many as the sepals, free, rarely absent. *Stamens* usually indefinite, free or connate, frequently inserted on a gonophore; anthers introrse. *Ovary* free, 2-10-celled; styles columnar, or parted into as many divisions as there are cells in the ovary; placentation axile. *Fruit* a drupe or a capsule.

Analysis of the Genera.

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| Fruit without bristles or spines . . . | 1. GREWIA. |
| Fruit spiny or bristly . . . | 2. TRIUMFETTA. |

1. *Grewia*, Linn.

Trees or shrubs, more or less stellate-pubescent. *Leaves* alternate, usually distichous, often inequilateral, variously toothed, with 3-7 basal nerves. *Flowers* usually 2-sexual, axillary, solitary, cymose or paniced. *Sepals* 5, distinct, coriaceous, coloured inside. *Petals* 5, usually glandular at the base, sometimes wanting. *Stamens* indefinite, free, all fertile, inserted on a gonophore when the petals are glandular. *Ovary* 2-4-celled. *Fruit* a drupe, more or less fleshy, entire or lobed; lobes 1- or more-seeded.

Analysis of the Species.

- Peduncles generally solitary, leaf-opposed; leaves scaberulous . . . 1. *G. oppositifolia*.
- Peduncles generally fascicled, axillary.
- Leaves oblong or ovate, 5-7-nerved, more or less cordate.
- Drupe fleshy, under .5 in. diam.; leaves softly hairy beneath.
- Trees.
- Leaves usually rounded or slightly cordate at the base, finely serrulate; petioles .2-.5 in. long; buds ovoid, not ribbed . . . 2. *G. elastica*.
- Leaves usually distinctly cordate, distinctly serrate; petioles .4-.8 in.; buds cylindrical or clavate, ribbed . . . 3. *G. Hainesiana*.
- An undershrub. Peduncles slender, much longer than the petioles . . . 4. *G. sapida*.
- Drupe crustaceous, about 1 in. diam.; leaves scabrous . . . 5. *G. sclerophylla*.
- Leaves lanceolate, 3-nerved, never cordate.
- Leaves glabrescent; drupe rugose, 2-lobed, black when ripe . . . 6. *G. disperma*.
- Leaves velvety beneath; drupe shining, smooth, 4-lobed, whitish when ripe . . . 7. *G. hirsuta* var. *helicterifolia*.

1. *G. oppositifolia*, Roxb.; Fl. Br. Ind. i. 384; Brandis For. Flora 37, Ind. Trees 95; Gamble Man. Ind. Timb. 109. Vern. *Biul*, *Bivr*, Jaunsar; *Bewal*, *Bhimal*, Dún; *Behel*, Saháranpur.

A moderate-sized tree with whitish bark. Leaves 3-6 by 1.5-3 in., broadly ovate-lanceolate, acuminate, obtusely but closely serrate, scabrous above, pubescent beneath; base unequally rounded, usually 3-nerved (occasionally 3-6-nerved); cross-veins transverse and straight; petiole .2-.5 in.; stipules subulate, caducous. Flowers in leaf-opposed umbellate cymes, rarely axillary or terminal; buds cylindrical, pilose. Sepals linear, .6-1 in. long, 3-ribbed, red and smooth inside. Petals linear, shorter than the sepals, white or yellow. Drupe 1-4-lobed, fleshy, dark-green, black when ripe, rough with scattered stiff white hairs.

Fairly common in the DÚN, e.g., Tháno, Lachiwála, Phán-dowála, Ámbári, etc.; more so along the foot of the SAHÁRANPUR SIWALIKS and in the Pathri Forest. Also found in JAUNSAIR up to 6,000 ft., often cultivated about villages; Saia, Dálmigádh, Tons Valley, etc.

It reaches about 40 ft. in height, with a short trunk and a spreading crown. Wood white, weighing 45-50 lbs. per c. ft. It is unpleasantly scented, and is therefore seldom used for fuel. Being tough and elastic, it is used for oar-shafts, axe-handles, banghy-poles, bows, etc. The inner bark yields a fibre which is used for rope and paper-making and the leaves are much valued for fodder, especially in the Hills. The ripe fruit is eaten.

Fl. April-June, and occasionally in winter in the Saháranpur Forests. Fr. Oct.-Dec.

There seem to be two forms, if not two varieties, grouped under this—one represented by the SAHÁRANPUR tree with white petals, and the other by the HILL one which has yellow petals.

2. *G. elastica*, Royle; Syn.—*G. vestita*, Wall.; Brandis For. Flora 40, Ind. Trees 98; Gamble Man. Ind. Timb. 11. Syn.—*G. asiatica*, var. *vestita*, Wall.; Fl. Br. Ind. i. 387. Vern. *Dháman*, Hind.

A tree with grey bark; branches and young plants with large white blotches. Leaves 3-5 by 2-3.5 in., obliquely ovate, rounded or slightly cordate at the base, acuminate, minutely serrate, sometimes obscurely 3-lobed, pale and softly downy beneath, especially when young; basal nerves 5-6; petiole generally not exceeding .5 in.; stipules linear. Flowers in densely crowded (rarely solitary) axillary cymes; peduncles .3-.4 in. long, hairy, bearing 2-3 bracteolate pedicels; buds ovoid, .15-.2 in. long, not ribbed. Sepals slightly pubescent and yellow inside. Petals yellow, much shorter than the sepals, claw distinct or 0. Drupe globose, .2-.3 in. diam., sometimes indistinctly 2-4-lobed, dark-brown or black when ripe.

A very common tree in both Sál and mixed forests of the DEHRA DUN DIVISION, extending to the SIWALIKS and to the OUTER HIMALAYAN slopes and low-level valleys in JAUNSAIR.

Wood grey, tough, elastic, hard and close-grained, used for banghy-poles, bows, spear-handles, etc. Weight about 50 lbs. per c. ft. The branches are lopped for fodder, and the fruit is eaten. The bark yields strong white fibre.

Fl. April-June. Fr. Aug.-Nov.

This is a very variable species and two forms can usually be distinctly recognised but at times they pass into one another.

Var. 1 *elastica* proper—Leaves very tomentose, white beneath. Found chiefly in the hills.

Var. 2 *vestita*, Wall. (sp.).—Leaves much less tomentose, green beneath.

3. *G. Hainesiana*, Hole; Syn. *G. asiatica* (non Linn.); Fl. Br. Ind. i. 386 (in part); Brandis For. Flora 40, Ind. Trees 98; Gamble Man. Ind. Timb. 111. Vern. *Phálsá*, *Phálsá-Dháman*, Hind.

A small or moderate-sized tree; bark dark-grey or greenish-white, longitudinally wrinkled; young parts tomentose. *Leaves* 4-6 by 3-5 in., obliquely ovate or orbicular, closely and irregularly serrate, densely brown-tomentose beneath when young, but green both sides when mature; base 5-7 nerved, more or less cordate; petiole 4-8 in., densely tomentose, thickened at the top, rather stout; stipules linear. *Peduncles* generally 2-3, rarely more or solitary, usually shorter than or as long as the petioles; pedicels 2-3, somewhat shorter than the peduncles; buds cylindrical or clavate, generally distinctly ribbed, softly woolly. *Sepals* 3-4 in. long, oblong-lanceolate, rusty-floccose outside, orange and glabrous inside. *Petals* oblong, yellow, half the length of the sepals. *Drupe* globose, about 4 in. diam., not or indistinctly 2-lobed, pilose, dark-brown when ripe.

Two distinct forms of this plant are met with:—1. a stunted tree with a short trunk, straggling branches and short-petioled more or less orbicular hard leaves, more common about Rámgarh in the DŪN; and 2. a middle-sized tree with a large spreading crown and long-petioled somewhat soft ovate leaves, found along the foot of the SAHÁRANPUR SIWALIKS, especially at Beribará, and in the Tons and Ámláwa valleys in JAUNSAAR.

Wood similar to that of *G. vestita*, and is used for the same purposes. The sweetmeat-makers of Saháranpur use the mucilaginous bark to clarify sugar. The fruit is eaten, and the tree is often cultivated for its sake.

Fl. April, May. Fr. June-Aug.

G. asiatica, Linn. A large shrub, only found in cultivation in gardens. It is doubtfully wild in India and even in cultivation, it is not at all common within the area of this Flora. As found in cultivation it approaches *G. sapida* from which it can always be distinguished by the base of the leaf, which in *G. asiatica* is always more or less cordate, whereas the leaf-base in *G. sapida* is invariably cuneate.

4. *G. sapida*, Roxb.; Fl. Br. Ind. i. 387; Brandis For. Flora 41, Ind. Trees 98; Gamble Man. Ind. Timb. 108. Vern. *Bistú*, Jaunsar; *Phálsá*, Hind.

A prostrate undershrub with a perennial woody rootstock throwing out annually a number of switchy shoots, which, after bearing leaves, flowers and fruit, are burnt or browsed down to be renewed next year. *Leaves* 2-4 by 1.5-3 in., ovate obovate or orbicular, usually doubly serrate, sometimes obscurely lobed, pilose or scabrid above, pubescent beneath; petiole .2-.3 in. long; stipules linear. *Flowers* axillary; peduncles 2-5 together, .7-1.2 in. long, slender, each 2-5-flowered; buds oblong. *Sepals* oblong, .2-.3 in. long, reddish brown inside. *Petals* yellow, half the length of the sepals, elliptic, entire. *Drupe* the size of a pea, slightly lobed.

Open grass-lands up to 3,500 ft. Common in fire-traces and forest paths in the SIWALIK DIVISION, also in low valleys in the HILLS, e.g., at Thadiár, Bamsu, etc.

A favourite fodder plant. Fruit edible.

Fl. April, May. Fr. Oct., Nov.

5. *G. sclerophylla*, Roxb.; Brandís For. Flora 39; Syn.—*G. scabrophylla*, Roxb.; Fl. Br. Ind. i. 387; Brandis Ind. Trees 99. Vern. *Gúrbhelí*, Dún.

A small shrub 5 to 6 ft. high, apt to be mistaken for a young *Helicteres Isora*, which it somewhat resembles in foliage. *Leaves* 4-7 by 3-4 in., ovate or obovate, acuminate, irregularly serrate, coriaceous, scabrous above, pubescent beneath; basal nerves 3-5; petiole .5-.7 in. long; stipules subulate. *Flowers* .7 in. long, white; buds ribbed. *Sepals* pubescent, more than twice the length of the petals. *Petals* white, notched. *Drupe* about .8 in. diam., globose, slightly depressed, with a brown crustaceous and scabrous rind and a scanty pale-yellow viscid sweetish pulp; stones 4.

Common in open grass-lands in the DÚN and SAHÁRANPUR FORESTS. The stem yields a strong white fibre which can be made into ropes. Fruit edible but not very tasty.

Fl. Apr.-Sept. Fr. Nov.-Mar.

6. *G. disperma*, Rottl.; Syn.—*G. lævigata*, Vahl.; Fl. Br. Ind. i. 389; Brandis For. Flora 42, Ind. Trees 96; Gamble Man. Ind. Timb. 111. Vern. *Kath Bhemal*, *Phirsau*, Dún.

A small tree; bark dark-brown. *Leaves* 3-5 by 1.3-2 in. tapering at both ends, acuminate, serrate, glabrescent or with a few scattered hairs, 3-nerved; transverse veins fine; petiole .5 in. long; stipules linear, caducous. *Flowers* axillary; peduncles 2-3 together, longer than the petiole, each 2-3-flowered. *Sepals* about 1 in. long; 3-ribbed. *Petals* white, about one-fourth the length of the sepals, entire. *Style* longer than the stamens. *Drupe* .3 in. diam. 1-4 lobed, rugose, black when ripe.

Throughout the DÚN in shady localities and in ravines ; also in the western half of the SAHÁRANPUR FORESTS, and valleys in the HILLS.

The leaves are lopped for fodder.

Fl. June-Sept. Fr. Cold season.

7. *G. hirsuta*, Vahl. var. *helicterifolia*, Wall. ; Syn.—*G. polygama*, Auct. plur. (non Roxb.) ; Fl. Br. Ind. i. 391 ; Brandis For. Flora 42, Ind. Trees 100.

An undershrub with a short trunk and bifarious spreading branches. *Leaves* 2-3 in. long; narrow-lanceolate, sharply serrate, nearly glabrous above, white-tomentose beneath. *Flowers* polygamous, mostly 1-sexual, on slender axillary peduncles. *Stigma* stellate. *Drupe* .5 in. diam., whitish-brown, shining, sometimes with a few scattered hairs.

In blanks throughout the DÚN and SAHÁRANPUR FORESTS, chiefly with sál; also in grass-lands. Pathri Forest. Particularly common in the SIWALIK TRACTS.

The leaves are browsed by cattle.

Fl. July, Aug. Fr. Nov., Dec.

2. *Triumfetta*, Linn.

Herbs or undershrubs with stellate pubescence. *Leaves* serrate, entire or 3-5-lobed. *Flowers* yellow, axillary or leaf-opposed, few or densely cymose. *Sepals* 5, distinct, frequently mucronate at the apex. *Petals* 5 (rarely 0) glandular, thickened or foveolate at the base. *Stamens* 5-25, free, inserted on a glandular torus. *Ovary* 2-5-celled with 2 ovules in each cell. *Style* filiform. *Stigma* 2-5-toothed. *Fruit* sub-globose, spiny or bristly, indehiscent or tardily dehiscent. *Seed* 1-2 in each cell, pendulous.

Analysis of Species.

Leaves ovate-lanceolate, not lobed ;

lower half of the spines of the fruit

hispid ; stamens 10 .

. 1. *T. pilosa*.

Lower leaves more or less 3-lobed ;

spines of the fruit glabrous ; stamens

8-15 2. *T. rhomboidea*.

1. *T. pilosa*, Roth. ; Fl. Br. Ind. i. 394.

A branched shrub, 3-6 ft. high ; stem sometimes woody, branches with bulbous-based hairs. *Leaves* 3-5 in. long, ovate to ovate-lanceolate, acuminate, irregularly serrate, stellately hairy on both surfaces, base rounded or subcordate ; *petiole* .5-1.5 in. long, villous ; *stipules* linear-lanceolate, acuminate. *Flowers* in fascioled axillary and leaf-opposed cymes ; *peduncles* usually shorter than the petioles, hairy. *Sepals* 3-4 in. long, linear, stellate-hairy, apiculate. *Petals* yellow, linear-oblong or oblanceolate, a little shorter than the sepals, densely ciliate at the base. *Stamens* 10. *Fruit* including the spines about .75 in. diameter, 4-celled, 8-seeded ; spines .2-25 in. long, hooked, hispid in the lower half.

Dehra Dun and Tehri-Garhwal up to 4,000 ft.—Bindal Rau ; Nalapani ; Lachiwala ; etc.

Fl. Aug.-Sept.

2. *T. rhomboidea*, Jacq. ; Fl. Br. Ind. i. 395.

Suffruticose 2-5 ft. high ; branches slender more or less pubescent with simple hairs. *Leaves* 2-3.5 long by 1.5-3 in. broad, broadly ovate, the lower usually 3-lobed, irregularly serrate, pubescent on both surfaces, base cuneate to rounded or subcordate, 3-7-nerved ; uppermost leaves usually lanceolate and not-lobed ; *petiole* up to 1.5 in. long. *Flowers* in dense terminal and leaf-opposed cymes .25 in. diameter, yellow ; *bracts* subulate. *Sepals* oblong, hooded, apiculate. *Petals* oblong, shorter than the sepals, ciliate at the base. *Stamens* 8-15. *Fruit* ellipsoid or subglobose, about .25 in. diameter, white-tomentose between the glabrous hooked spines.

Throughout the Dún ascending to 4,000 ft. in the Himalaya. The plant is used in medicine and the stem yields a good fibre.

Fl. Aug.-Oct.

Corchorus olitorius, Linn. ; Fl. Br. Ind. i. 397. An annual or perennial glabrous herb, usually about 3-4 ft. high, much taller in cultivation. *Leaves* 3-4 in. long, elliptic-lanceolate, acuminate, serrate, the lower serratures on each side prolonged into a filiform appendage over .25 in. long, rounded at the base, 3-5 nerved ; *petiole* .7-1.5 in. long, slightly hairy ; *stipules* subulate. *Peduncles* mostly extra-axillary or leaf-opposed, 1-3-flowered, shorter than the petiole. *Flowers* yellow. *Sepals* oblong, apiculate, about

·12 in. long. *Petals* oblong-spathulate, longer than the sepals. *Stamens* indefinite, free. *Capsule* 2 in. long, linear, cylindric, erect, 10-ribbed, beaked, 5-valved; valves with transverse partitions between the seeds.

Found in Dehra Dun, and also in large quantities in the Pathri Forest, Saháranpur District.

The well-known fibre *Jute* is obtained from this plant as well as from other species of the same genus. The very light soft wood is used for country-made sulphur matches.

DISCIFLORAE.

Order 1.--GERANIALES.

XVII. LINACEÆ.

HERBS or shrubs. *Leaves* usually alternate, simple, entire, rarely crenate. *Flowers* regular, 2-sexual, usually 5-merous. *Sepals* quite entire. *Petals* contorted in bud, fugacious, each with a gland inside near the base, adnate to the staminal ring. *Stamens* 5, often alternating with minute staminodes, or 10, connate at the base into a tube or ring; anthers versatile. *Ovary* 3-5-celled; styles 3-5, more or less free. *Fruit* a capsule, splitting into 3-6 cocci.

1. *Reinwardtia*, Dumort.

1. *R. trigyna* Planch.; Fl. Br. Ind. i. 412; Brandis Ind. Trees 107; Gamble Man. Ind. Timb. 116. Vern. *Basant*, Dún; *Pengün*, Jaunsar.

A glabrous undershrub, 2 to 3 ft. high or occasionally higher. *Leaves* 1-4 in. long, narrow-oblong or oblanceolate, narrowed into a slender petiole, usually entire and mucronate, membranous. *Flowers* about 1 in. long, in axillary or terminal cymes or panicles, sometimes solitary. *Sepals* 5, green, lanceolate, acuminate. *Petals* 5, bright-yellow, obovate, about 1 in. long. *Styles* usually 3, more or less connate below. *Capsule* the size of a pea, papery.

Very common in the DÚN and the HILLS up to 6,000 ft., growing fairly large if not too much browsed.

Fl. Feb.-April. Fr. April-June.

XVIII. MALPIGHIACEÆ.

Climbing or suberect shrubs. *Leaves* opposite, simple, entire, usually exstipulate. *Flowers* regular or irregular, bisexual, pentamerous, white or yellow, in axillary or terminal panicles. *Calyx* deeply 5-partite, usually with a large gland outside. *Petals* free. *Disk* obscure. *Stamens* 10, hypogynous, equal or unequal; filaments free or connate below. *Ovary* free, 3-celled, 3-lobed; cells 1-ovuled; styles 1-3. *Fruit* of 1-3 samaras. *Seeds* exalbuminous.

Analysis of the Genera.

- | | |
|--|------------------|
| Calyx glandular; style 1; carpels winged
only at the end | 1. HIPTAGE. |
| Calyx eglandular; styles 3; carpels
winged all round | 2. ASPIDOPTERYS. |

1. *Hiptage*, Gärtn.

1. *H. Madablota*, Gärtn.; Fl. Br. Ind. 148; Brandis For. Flora 44, Ind. Trees, 108; Gamble Man. Ind. Timb. 118. Vern. *Anetá*, Dún; *Madh Málti*, Hind; *Mádhavilatá*, Sans.

A large evergreen climbing shrub. *Leaves* 4-6 by 1·5-2·5 in., oblong or ovate-lanceolate, acuminate, entire, coriaceous, glabrous; main lateral nerves 4-6 pairs, arcuate, base acute, rarely rounded; petiole ·2-·5 in. long; stipule 0. *Flowers* showy, fragrant, in large terminal and smaller axillary panicles. *Calyx* with a large oblong gland outside; segments ·2 in. long, imbricate, pubescent. *Petals* ·5-·7 in. long, unequal, silky, clawed, fimbriate, 4 white, 1 yellow. *Stamens* 10, one much larger than the rest. *Style* 1, filiform. *Fruit* of 1-3 samaras; wings 3, obovate or oblanceolate, one large about 2 by ·5 in., two small about 1 by ·2 in.

Common in ravines and moist places in the DÚN, e.g., the Bindál nála, Kuáwála, Nakraunda, Nágsidh, Karwápani, etc.; also at Kálsi.

The woody stem is used for fuel.

Fl. Feb.-April. Fr. May, June,

2. *Aspidopterys*, A. Juss.

1. *A. Wallichii*, Hook. f.; Fl. Br. Ind. i. 421; Brandis Ind. Trees 110; Gamble Man. Ind. Timb. 118. Vern. *Jugter*, Málköt.

A climbing shrub; branches slender, white-pubescent. *Leaves* usually opposite,* sometimes in whorls of three, 3-5 by 2·5-3·5 in., ovate oblong or orbicular, acuminate, glabrescent above, white-tomentose beneath; main lateral nerves 4-5, arcuate; base subcordate or rounded; petiole 5-7 in. long. *Panicles* large, pendulous, terminal but running down among the leaves below so as to appear partly axillary; pedicels rather stout, with very minute bracteoles. *Flowers* white or cream-colour, about 2 in. across. *Calyx* glandular, minute. *Petals* 5, equal, entire, not clawed, 3 or 4 times the length of the calyx. *Stamens* 10, all fertile. *Ovary* white-tomentose; styles 3, glabrous. *Fruit* of 1-3 samaras; wings variable, usually orbicular-oblong, 1-1·5 in. long; nucleus without crest or wing.

Hedges and open forest lands throughout the DEHRA DUN DIVISION and the OUTER HIMALAYA;—very conspicuous in fruit.

Fl. Aug., Sept. Fr. Nov., Dec.

XIX. RUTACEÆ.

Trees or shrubs, rarely herbs, usually aromatic. *Leaves* alternate, compound, rarely opposite or simple, exstipulate, usually with translucent glandular dots. *Flowers* regular, in cymes, corymbs or panicles, rarely solitary. *Calyx* of 4-5 small imbricate lobes. *Petals* as many as the calyx lobes, usually hypogynous. *Stamens* as many or twice as many as the petals, rarely more, with an annular or cylindrical disk within; anthers 2-celled, often versatile. *Ovary* of 4-5 free or connate carpels; styles 1-5, usually free. *Fruit* a berry, less frequently capsular or drupaceous.

* There is a specimen in the College Herbarium with leaves distinctly alternate, which is quite exceptional in the Family.

*Analysis of the Genera.***Armed.**

- Scandent shrubs. Fls. polygamous;
 style 1 2. TODDALIA.
 Erect shrubs or trees.*
 Flowers 1-sexual; styles 2-5; fruit of
 capsular carpels 1. ZANTHOXYLUM.
 Flowers 2-sexual; style 1; fruit a
 berry.
 Leaves 3-foliolate or imparipin-
 nate; pericarp pulpy 6. LIMONIA.
 Leaves 1-foliolate; pericarp leathery 9. CITRUS.
 Leaves 3-foliolate; pericarp woody 10. ÆGLE.

Unarmed.

- Flowers polygamous; petals valvate.
 Trees. Leaves 1-(rarely 3-) foliolate,
 thin; stamens 8 3. ACRONYCHIA.
 A small shrub. Leaves simple, fleshy;
 stamens never more than 5 4. SKIMMIA.
 Flowers 2-sexual; petals imbricate.
 Leaves 1-5-foliolate; style persistent.
 (Flowers paniced; filaments subu-
 late) 5. GLYCOSMIS.
 Leaves imparipinnate; style deciduous.
 Flowers corymbose or solitary;
 ovary usually 2-celled 7. MURRAYA.
 Flowers usually in terminal panicles;
 ovary 4-5-celled 8. CLAUSENA.

1. *Zanthoxylum*, Linn.

1. *Z. alatum* Roxb.; Fl. Br. Ind. i. 493; Brandis For. Flora 47, Ind. Trees 116; Gamble Man. Ind. Timb. 121. Vern. *Timbūr*, *Timrū*, *Temrū*, Jaunsar; *Tejbal*, Hind.

A shrub or small tree with corky bark, and strong prickles on the branches, petioles and midrib of the leaflets; branchlets often rough with raised grey specks. Leaves alternate, imparipinnate, common petiole and rachis narrowly winged. Leaflets 2-6 pairs, opposite, sessile, 1-3 by 3-8 in., elliptic-lanceolate, more or less serrate, obtusely acuminate pellucid-punctate. Flowers small, yellow, usually 1-sexual, in dense lateral panicles. Calyx 6-8-fid.

* Some species of *Zanthoxylum*, not found within the limits of this Flora, are scandent.

Petals none. *Stamens* 6-8, much exceeding the calyx; anthers large. *Fruit* usually of a solitary carpel which dehisces ventrally, of the size of a peppercorn, tubercled, strongly aromatic.

Hot valleys and in forest undergrowth up to 6,000 ft. in JAUNSA, TEHRI-GARHWAL and the OUTER-HIMALAYA. Above Rájpur; Dhármigádh, Tons and Bámsu Valleys; Korwá, Koti Forest, etc.

Wood close-grained, heavy, hard, and of a yellow colour (whence the generic name), used for walking sticks. Tooth-brushes are made of the branchlets, which and also the aromatic fruit are good for toothache. The fruit is also used as a condiment and to purify water. The bark is used to intoxicate fish.

Fl. April-June. Fr. Aug.-Oct.

2. *Toddalia*, Juss.

1. *T. aculeata*, Pers.: Fl. Br. Ind. i. 497; Brandis Ind. Tree 119; Gamble Man. Ind. Timb. 123. Vern. *Kánj*, Hind.

A large prickly scandent shrub, even old stems bearing curved prickles with a large conical corky base. *Leaves* alternate, usually 3-foliate. *Leaflets* sessile, 2-4 by 7-15 in., obovate elliptic or oblanceolate, crenulate, glabrous, more or less coriaceous, with many straight lateral nerves. *Flowers* polygamous, in axillary cymes or less frequently in terminal panicles, 2 in. diam., pale-yellow. *Calyx* usually 5-lobed, pubescent outside. *Petals* 5, imbricate. *Stamens* generally 5, longer than the petals in the male flowers, imperfect or 0 in the female flowers; anthers round. *Ovary* 5-celled. *Fruit* globose, the size of a large pea, shallowly 5-grooved or -lobed; seeds reniform.

In swampy places or deep open ravines in the Dún, e.g., Káluwála, Nakraunda, Mothronwála, Bindál nálá, etc.

The bark of the roots gives a yellow dye, and a bitter aromatic tonic which is used as a remedy for fever.

Fl. Feb.-April. Fr. July-Sept.

3. *Acronychia*, Forst.

1. *A. laurifolia*, Bl.; Fl. Br. Ind. i. 498; Brandis Ind. Trees 116; Gamble Man. Ind. Timb. 124.

A tree. *Leaves* usually 1-foliate, subopposite or crowded at the ends of the branches. *Leaflets* variable, 3-8 by 1.5-3 in., elliptic-oblong obovate or oblanceolate, quite entire, glabrous, sometimes

obtusely acuminate, more or less aromatic; base acute; lateral nerves 12-15 pairs; petiolule .5-1 in. long. *Cymes* axillary, trichotomous corymbose; peduncles 3-4 in. long, slender. *Flowers* whitish, fragrant; buds oblong. *Calyx* 4-lobed; lobes small, rounded. *Petals* 4, valvate, .2 in. long, oblong, with a broad base, more or less villous inside. *Stamens* 8, alternately longer; filaments subulate, bearded below. *Ovary* 4-celled, hairy, sunk in the disk. *Fruit* a drupe, .3-4 in. diam., slightly lobed or grooved; seeds black.

Occurs but rarely in the DÚN—Mothronwála swamp.

Wood white, fine- and close-grained, but liable to crack; weight about 42 lbs. per c. ft. Old stems sometimes with irregular patches of brown mottled harder wood inside, which, however, is not the true heartwood.

Fl. May-July. Fr. Nov.-Jan.

4. *Skimmia*, Thunb.

S. Laureola, Hook. f.: Fl. Br. Ind. i. 499; Brandis For. Flora 50, Ind. Trees 116; Gamble Man. Ind. Timb. 124. Vern. *Kathár-chará*, *Gurtpatá*, Jaunsar.

A strongly aromatic small evergreen shrub; bark white. *Leaves* 4-6 by .8-1.5 in., alternate, simple, oblong oblanceolate or obovate, acute or acuminate, coriaceous, rather succulent, quite entire, glabrous, gland-dotted, crowded at the ends of the branches; midrib stout; nerves indistinct; petiole .1-3 in., flattened above. *Flowers* polygamous, yellow, .3-5 in. diam., in compact terminal panicles. *Calyx* 4-5-lobed, imbricate. *Petals* 4-5, oblong, valvate. *Stamens* 4-5, hypogynous; filaments stout, subulate. *Ovary* 2-5-celled; style 1. *Fruit* an ovoid or subglobose fleshy drupe, .5-7 in. long, red when ripe, with 2-5 1-seeded stones.

A common undershrub in shady localities in the HILLS 6-10,000 ft., generally in dense gregarious patches. "The odour of the musk-deer *Kastúrá* is popularly supposed to be derived from it."—Mr. A. Smythies.

Fl. April, May. Fr. July-Sept.

5. *Glycosmis*, Correa.

1. **G. pentaphylla**, Correa: Fl. Br. Ind. i. 499; Brandis For. Flora 49, Ind. Trees 112; Gamble Man. Ind. Timb. 125. Vern. *Ban Nimbá* Hind.

A small evergreen shrub. *Leaves* alternate, usually 1-5-foliolate; petiole and rachis stout. *Leaflets* very variable in size and shape, usually 4-6 by 1-5-2 in., ovate lanceolate or obovate, entire or obscurely crenulate, dark-green, quite glabrous. *Flowers* white, fragrant, in axillary or terminal panicles. *Calyx* 4-5-fid; segments broad. *Petals* 4-5, white, imbricate. *Stamens* 8-10, free; filaments dilated below. *Ovary* 2-5 celled; style short, persistent. *Fruit* a globose or depressed berry, pink or bluish-white when ripe, with an aromatic sweetish pulp.

Forms a thick undergrowth in shady moist evergreen forests in the DŪN, e.g., Khairi, Kānsrāo, Nakraunda and Kāluwāla; also at Kālsi.

The wood is tough and hard, but is seldom found of a utilizable size. It makes a good hedge-plant, for which purpose it is often planted. The twigs are used as tooth-sticks. The ripe fruit is eaten, and the roots are used in country medicine.

Fl. and Fr. throughout the year.

6. *Limonia*, Linn.

1. *L. crenulata*, Roxb.; Syn.—*L. acidissima* Auct. plur. (not. of Linn.); Fl. Br. Ind. i. 507; Brandis For. Flora 47, Ind. Trees 118; Gamble Man. Ind. Timb. 127. Vern. *Belī*, Hind.

A large spinous shrub or small tree with white or ash-coloured corky bark. *Leaves* alternate, imparipinnate, 3-6 in. long; petiole and the rachis between each two pairs of leaflets winged to the size and shape of leaflets. *Leaflets* 5-9, 1-1-5 in. long, quite sessile, ovate-rhomboid or ovate-lanceolate, acuminate, crenulate, gland-dotted; base cuneate. *Flowers* 4-merous, white, fragrant, in short axillary often leaf-bearing racemes. *Calyx* 4-partite, small. *Petals* 4, elliptic or oblong, much larger than the calyx-segments. *Stamens* 8, inserted round an annular or columnar disk. *Ovary* 4-celled; cells 1-ovuled; style short, deciduous. *Fruit* a globose berry, 3-4 in. diam., fleshy, black when ripe, exceedingly acid (whence the specific name).

Common in the EASTERN DŪN and western half of the SAHĀ-RANPUR SIWALIKS; Thāno, Lachiwāla, Barkālā, etc.

Wood cream-coloured, hard and close-grained, capable of employment as a substitute for box-wood, but chiefly used for fuel walking-sticks are made of the branches. "The pulp of the fruit is considered protective against contagion, and an antidote to venomous poisons."—*Sir D. Brandis*.

Fl. April, May. Fr. Cold season.

7. *Murraya*, Linn.

Unarmed shrubs or small trees. *Leaves* alternate, imparipinnate. *Leaflets* alternate, petioluled. *Flowers* 2-sexual, cymose or corymbose. *Calyx* 5-fid. *Petals* 5, imbricate. *Stamens* 10, the alternate shorter; filaments subulate; anthers short. *Ovary* usually 2-celled; style simple, long, articulated, deciduous. *Fruit* a berry.

Analysis of the Species.

- An evergreen shrub. Leaflets 3-9; fruit
red when ripe 1. *M. exotica*.
A deciduous shrub. Leaflets 9-25; fruit
black when ripe 2. *M. Koenigii*.

1. *M. exotica*, Linn.; Fl. Br. Ind. i. 502; Brandis For. Flora 48, Ind. Trees 113; Gamble Man. Ind. Timb. 125. Vern. *Bilgár*, Dún; *Márchulá*, Garhwal. *Kamini*, Hind.

An evergreen shrub or small tree with thin grey corky bark. *Leaves* dark-green, glabrous, 3-8 foliolate. *Leaflets* 1-3 by .5-1 in., obliquely rhomboid, more or less acuminate, entire, shining above, coriaceous when mature; petiolule .1 in. long. *Flowers* 1 in. long, white, very fragrant, in terminal or axillary corymbs, sometimes solitary. *Sepals* minute, acute, dotted. *Petals* oblong-lanceolate. *Ovary* linear, 2-celled. *Berries* .5-.7 in. long, narrowed at both ends, 2-seeded, rugose, red or deep orange when ripe.

Cool shady ravines in the DÚN and OUTER HILLS, and along ráus in the SAHÁRANPUR SIWALIKS.

Wood close-grained, hard, light-yellow, capable of being used for wood-engraving; weight 62 lbs. per c. ft. Handles of implements and walking-sticks are made of it, and the twigs are used for tooth-brushes. It is often planted as an ornamental shrub.

Fl. Mar.-Sept. but often throughout the year. Fr. Oct.-Feb.

2. *M. Koenigii*, Spreng.; Fl. Br. Ind. i. 503; Brandis For. Flora 48, Ind. Trees 113; Gamble Man. Ind. Timb. 126. Vern. *Gandhela*, Dún; *Kath Nim*, Hind.

A deciduous shrub with thin dark-brown bark. *Leaves* 6-12 in. long; rachis terete, pubescent. *Leaflets* 10-25, 1-2 in.

long, ovate or lanceolate, oblique at the base, obtusely acuminate or retuse, subentire or irregularly crenulate; petiolule .1 in. *Flowers* .3-.5 in. long, white, in terminal corymbose panicles. *Sepals* small, acute. *Petals* oblong, dotted. *Ovary* 2-celled. *Fruit* subglobose, .3 in. diam., rugose, black when ripe.

A common undershrub in the DÚN and SAHÁRANPUR FORESTS, generally in ravines and on waste lands. Often gregarious under *khair* and *sissu* in dry beds of streams in the DÚN, e.g., near Kánsráu.

Wood even-grained, hard and durable, capable of being used for agricultural implements. The fresh leaves have a fetid smell, but give an agreeable flavour to curries, and are much used for this purpose in Southern India where it is known as the Curry-plant.

New leaves Mar., April. Fl. April, May. Fr. Cold season.

8. *Clausena* Burm.

C. pentaphylla, DC.; Fl. Br. Ind. i. 503; Brandis For. Flora 49, Ind. Trees 114. Vern. *Ratanjot*.

A strongly aromatic shrub 3-4 ft. high; young parts silky-tomentose. *Leaves* imparipinnate, 3-7-foliate; *leaflets* 3-6 in. long, subopposite or alternate, ovate or lanceolate, acuminate, entire, pubescent especially on the nerves; secondary nerves 10-15, rather irregular, prominent on the undersurface. *Flowers* 4-merous, .25 in. across, yellowish, in terminal panicles 4-10 in. long. *Sepals* triangular, acute. *Petals* oblong, concave. *Stamens* 10, the alternate ones shorter; *filaments* short, broad. *Berry* .3-.5 in. long, ovoid, pale-orange, verrucose.

Chakrata range and elsewhere, chiefly in Sál forest.

Fl. April-May.

The bruised leaves are highly aromatic.

1. *C. Wampi*, Blanco; Fl. Br. Ind. i. 505; Brandis Ind. Trees 114; Gamble Man. Ind. Timb. 127. Vern. *Am-pich*, Dún.

A sweet-scented evergreen tree. *Leaves* alternate, imparipinnate; petiole and rachis terete. *Leaflets* 5-9, 3-5 by 1.7-3 in., ovate elliptic or lanceolate, oblique, shining above, margins wavy or crenulate; petiolule .2-.3 in. long. *Flowers* 2-sexual, small, white, 4-5-merous, in large compound terminal panicles; inflorescence rusty-tomentose. *Calyx* 4-5-fid. *Petals* 4-5, imbricate, concave. *Fruit* a 1-seeded globose drupe, .6-.8 in. diam., with a tough glandular rind.

Cultivated in the DÚN for its fruit and as an ornamental plant.

Fl. Mar., April. Fr. June, July.

9. **Citrus**, Linn.

1. **C. medica**, Linn.; Fl. Br. Ind. i. 514; Brandis For. Flora 51, Ind. Trees 123; Gamble Man. Ind. Timb. 130. The Lemon or Lime. Vern. *Nimbrí*, Hind.

A shrub or small tree with strong axillary spines; bark greenish-grey, smooth. *Leaves* 1-foliolate; petiole 3-5 in. long, often winged. *Leaflets* 3-6 by 1-2.5 in., elliptic or ovate-lanceolate, entire or more or less serrate, coriaceous, glabrous. *Flowers* often 1-sexual 1-1 in. long, white, sweet-scented, in axillary cymes or solitary; pedicels 3-5 in. long, stout. *Calyx* cup-shaped, 3-5-toothed or entire. *Petals* 4-8, imbricate, 6-8 in. long, oblong, fleshy, with large glandular dots, often tinged pink outside. *Stamens* 20-40, round a large disk; filaments variously connate. *Ovary* many-celled; ovules 4-6 in each cell; style deciduous; stigma-lobed. *Fruit* 2-4 in. long, ovoid oblong or globose, with a thick or thin rind which is generally yellow when ripe; pulp cellular and juicy, usually acid.

Indigenous in damp localities in the DÚN, e.g., Nakraunda, Káluwála, Jogiwála, etc. Several varieties with acid or sweet juice are cultivated in gardens. The wood is tough and close-grained, and makes good walking-sticks.

Fl. April, May. Fr. Nov., Dec.

The following species are also cultivated in gardens in the DÚN :—

1. **C. Aurantium**, Linn.; Fl. Br. Ind. i. 515; Brandis Ind. Trees 123.—The Orange. Vern. *Nárengi*, Hind., of which there are several varieties, distinguishable from *C. medica* by pure-white 2-sexual flowers, and the characteristic colour and shape of the fruit.

2. **C. decumana**, Murr.; Fl. Br. Ind. i. 516; Brandis Ind. Trees 123. The Shaddock or Pumelo. Vern. *Chakurá*, Hind., a tree with large leaves, pubescent beneath; petiole broadly winged. *Flowers* large, white, strongly scented. *Fruit* 6-8 in. diam., globose or pyriform, with a thick spongy rind.

10. **Ægle**, Correa.

1. **Æ. Marmelos**, Correa ; Fl. Br. Ind. i. 516 ; Brandis For. Flora 57, Ind. Trees, 119 ; Gamble Man. Ind. Timb. 131. The Bael tree. Vern. *Bel*, *Bill*, *Bael*, Hind. ; *Vilva*, Sans.

A glabrous deciduous tree with grey corky bark and sharp straight axillary spines about 1 in. long. *Leaves* alternate, 3-foliate, with a resinous odour ; common petiole 1-2·5 in. long, terete. *Leaflets* 2-4 by 1-2·5 in., ovate-lanceolate or rhomboidal, acuminate, crenate, gland-dotted, the lateral sessile or with a petiolule about 1 in. long ; terminal petiolule 5-1 in. long, flattened above. *Flowers* greenish-white, about 1 in. diam., sweet-scented, in short lateral panicles. *Calyx* small, obscurely 4-5 toothed, pubescent, deciduous. *Petals* 4-5, imbricate, oblong, gland-dotted. *Stamens* numerous ; filaments short, subulate, often fascicled ; anthers long, narrow. *Ovary* 8-20-celled ; ovules many in each cell ; style short ; stigma deciduous. *Fruit* 2-7 in. diam., with a smooth grey or yellow woody shell, and a mass of sweet yellow aromatic mealy pulp.

Common in the EASTERN DÚN and SAHÁRANPUR SIWALIKS, e.g., Rikhikesh ; Lachiwála ; Ránipur, etc. Often cultivated for its fruit, and as a sacred tree.

Wood even- and close-grained, tough and strong, but liable to split badly in seasoning ; weight 50-60 lbs. per c. ft. It is used in construction. The pulp of the ripe fruit is a laxative, and mixed with a little milk and sugar makes a very agreeable cooling sherbet. The unripe fruit, either boiled or roasted, is used as a specific for diarrhœa and dysentery. The pulp is also used to strengthen mortar. The mucus with which the cells of the fruit are filled is used for adhesive purposes, and is often mixed with water-paints to add to their strength and brilliancy. Snuff-boxes are made of the shell of the fruit. The leaves are very bitter and are used as a febrifuge ; they are also lopped for cattle fodder. They are considered indispensable for the worship of the god *Shiva*, and the wood, is one of the few that are prescribed by the Hindu scriptures for sacrificial fires.

Fl. Mar.-May, Fr. Mar.-June (next year).

XX. SIMARUBACEÆ.

Trees or shrubs with bitter bark. *Leaves* alternate, pinnate, usually exstipulate. *Flowers* in axillary pani-

clad cymes, small, regular, generally unisexual. *Calyx* 3-5-lobed, valvate or imbricate. *Petals* 3-5. *Disk* entire or lobed, rarely 0. *Stamens* as many or twice as many as the petals, hypogynous, inserted at the base of the disk; filaments free. *Ovary* 1-6-celled, usually deeply lobed or with distinct carpels. *Fruit* drupaceous or samaroid, rarely baccate or capsular. *Seeds* usually albuminous.

1. *Picrasma*, Bl.

1. *P. quassioides*, Bennett; Fl. Br. Ind. i. 520; Brandis For. Flora 59, Ind. Trees 127; Gamble Man. Ind. Timb. 133. Vern. *Karúi*, *Tithái*, Jaunsar.

A large shrub with bitter bark; branches few, stout, usually with white specks. *Leaves* lyrate imparipinnate, 9-15 in. long, rusty-tomentose. *Leaflets* 9-15, generally 3-4 by 1-1.5 in., the lowest pair smallest and the penultimate pair largest, sub-opposite ovate or oblong-lanceolate, long-acuminate, serrate, membranous, nearly glabrous when mature; petiolule of lateral leaflets .05-.08 in., of the terminal leaflet .5-1 in. long. *Flowers* 1-sexual or polygamous, .2 in. across, pale-green, in axillary panicles. *Calyx* 4-5-lobed. *Petals* 4-5, valvate, enlarged and coriaceous in fruit. *Stamens* 4-5; filaments with a thick hairy base; anthers versatile. *Fruit* a drupe, .2-.3 in. diam., black when ripe. *Seeds* albuminous.

OUTER HIMALAYA above Rájpur, also in shady ravines in JAUNSAAR and TEHRI-GARHWAL, 5,-8,000 ft.: Deoban, Bámnáigádh, Mundáli; Deotá; banks of the Rúpin, etc. Not very abundant.

Wood cream-colour, light, fine and close-grained. The bark has the same properties as quassia, and is used as a tonic in Indian medical practice.

Fl. April-June. Fr. July-Sept.

XXI. BURSERACEÆ.

Resinous trees or erect shrubs. *Leaves* alternate, imparipinnate, usually exstipulate. *Flowers* regular, small, 2-sexual or polygamous. *Calyx* free, 3-7-lobed,

often minute. *Petals* 3-7, usually distinct. *Disk* annular or cup-shaped, free or adnate to the base of the calyx. *Stamens* as many or twice as many as the petals; filaments free. *Ovary* 2-5-celled; ovules axile, 2-5 in each cell; style single. *Fruit* usually a drupe, rarely dehiscent. *Seeds* exalbuminous.

Analysis of the Genera.

- | | |
|---|---------------|
| Leaflets sessile; fruit 3-gonous, pericarp woody | 1. BOSWELLIA. |
| Leaflets petioluled; fruit globose, pericarp fleshy | 2. GARUGA. |

1. *Boswellia*, Roxb.

1. *B. serrata*, Roxb.; Fl. Br. Ind. i. 528; Brandis Ind. Trees 129; Gamble Man. Ind. Timb. 137. Syn.—*B. thurifera*, Coleb.; Brandis For. Flora 61. Vern. *Salái*, *Salár*, Hind.

A gregarious deciduous tree; bark reddish-yellow or greenish-grey, smooth, peeling off in thin papery flakes; young parts pubescent. *Leaves* exstipulate, pubescent, crowded at the ends of the branches; rachis stout, 10-15 in. long. *Leaflets* 8-15 pairs (besides the odd one), sub-opposite, sessile or less frequently minutely petioluled, 2-3 by .3-.6 in., lanceolate or linear, coarsely serrate, unequal-sided; tip rounded, sometimes mucronate. *Flowers* small, white, in axillary or sub-terminal fascicled racemes. *Calyx* 5-7-cleft, persistent. *Disk* annular, red, crenate. *Petals* 5-7, imbricate, broad-ovate. *Stamens* 10; anthers hairy. *Ovary* 3-celled. *Drupe* .5-.7 in. long, 3-gonous; carpels 1-seeded, at length separating septifragally; endocarp heart-shaped, bony, beaked, surrounded by a membranous wing.

Throughout the SAHÁRANPUR SIWALIKS, all by itself on steep sandy slopes, but in a mixed state on gentler slopes.

Sapwood large, rough-grained, soft and perishable, weight 20-35 lbs. per c.ft. An irregular-shaped mass of dark-brown mottled heavy wood is often found in the centre of large trees, which may be the heart-wood or perhaps a kind of ebony, quite capable of being used for ornamental purposes. The charcoal is

used for iron smelting in the Central Provinces. A transparent gum-resin exudes from wounds and cracks in the bark, which is used in medicine, and also burnt as an incense.

Leafless Mar.-June. Fl. April, May. Fr. July, Aug.

2. *Garuga*, Roxb.

1. *G. pinnata*, Roxb ; Fl. Br. Ind. i. 528 ; Brandis For. Flora 62, Ind. Trees 131 ; Gamble Man. Ind. Timb. 138. Vern. *Kharpat*, Hind.

A large deciduous tree ; bark grey or brown, exfoliating in hard round flakes, red inside. *Leaves* exstipulate, 9-15 in. long. *Leaflets* 5-9 pairs besides the terminal one, opposite, 2-4 by 1-1.5 in., oblong-or ovate-lanceolate, crenate, caudate-acuminate, more or less pubescent ; petiolule .1-2 in. long. *Flowers* polygamous, yellow, in large terminal panicles ; panicles 8-10 at the end of each branch, tomentose. *Calyx* campanulate, green ; segments 5, valvate. *Petals* 5, linear, induplicate-valvate, alternating with the calyx-segments. *Disk* large, clothing the calyx-tube. *Stamens* 10 ; filaments hairy. *Ovary* 4-5-celled, hairy. *Drupe* globose, .5-.7 in. diam.

A very common tree in the DÚN and SAHÁRANPUR FORESTS generally with Sál, but not uncommon in scrub forests and glades.

Wood soft and light and is chiefly used for fuel, but is much prized for house-posts in Eastern Bengal for its durability. The leaves are lopped for camel-fodder. The tree can be easily propagated by cuttings, and is occasionally thus planted in hedgerows.

Leafless Dec.-April. Fl. April, May. Fr. Oct., Nov.

XXII. MELIACEÆ.

Trees or shrubs with bitter bark and leaves. *Leaves* alternate, exstipulate. usually pinnate, rarely 2- or 3-pinnate or simple ; leaflets more or less oblique at the base. *Flowers* 2-sexual, regular, generally a large proportion sterile. *Calyx* 3-6-lobed. *Petals* 3-6, usually free. *Stamens* as many as the petals, or more frequently twice as many ; filaments usually connate

into a tube; anthers often sessile on the tube. *Disk* hypogynous, often forming a second tube inside the staminal tube. *Ovary* free, 3-5 celled; style simple. *Fruit* a drupe or a capsule. *Seeds* albuminous in the local species.

Analysis of the Genera.

- | | |
|--|-----------------|
| Stamens united into a tube; fruit a | |
| drupe; seeds not winged. | |
| Leaves only once pinnate; drupe | |
| 1-celled | 1. AZADIRACHTA. |
| Leaves 2- or 3-pinnate; drupe 5-celled | 2. MELIA. |
| Stamens free; fruit a capsule; seeds | |
| winged | 3. CEDRELA. |

1. Azadirachta, A. Juss.

1. **A. indica**, A. Jussieu; Brandis Ind. Trees 139.—Syn. *Melia indica*, Juss.; Brandis For. Flora 67; Gamble Man. Ind. Timb. 143. *M. Azadirachta*, Linn., Fl. Br. Ind. i. 544. The Neem tree. Vern. *Nim*, Hind.

A large handsome tree. *Leaves* imparipinnate, 9-15 in. long, glabrous. *Leaflets* 9-15, subopposite, 2-4 by .5-1 in., lanceolate or ovate-lanceolate, very unequal-sided, often falcate, deeply serrate, very gradually acuminate, bright-green and shining above, subsessile or with a minute petiolule. *Flowers* white, scented, in numerous axillary panicles which are shorter than the leaves; branches of panicles and pedicels very slender. *Calyx* small, flat; segments 5, rounded. *Petals* about .2 in. long, spathulate, ciliate. *Anthers* 10, inserted inside the staminal tube. *Ovary* 3-celled; *Drupe* .5-.7 in. long, ovoid-oblong, 1-celled, smooth, greenish-yellow when ripe.

Fairly common along the foot of the SAHÁRANPUR SIWALIKS and some distance in the interior, especially from Kasúmrí to Hardwar, unmistakably wild, if not indigenous. Cultivated for shade and ornament in the DÚN and SAHÁRANPUR DISTRICTS, as also throughout the greater part of India.

Sapwood grey; heartwood dark-red, very hard; weight about 50 lbs. per c.ft. It is used in construction and for furniture, and makes good sonorous drums. It is one of the woods held

sacred by the Hindus, and idols are made of it. The bark, leaves and fruit are used in medicine. The fruit gives an oil which is considered very good for small-pox sores and is also used for burning. The leaves are much lopped for goat and camel fodder.

Fl. Mar., April. Fr. July, Aug.

2. *Melia*, Linn.

1. **M. Azedarach**, Linn.; Fl. Br. Ind. i. 544; Brandis For. Flora 68, Ind. Trees 140; Gamble Man. Ind. Timb. 144. The Persian Lilac. Vern. *Bakāin*, *Dék*, *Dún*; *Deknoi*, Jaunsar.

A moderate-sized tree with smooth dark-grey bark. *Leaves* bipinnate, sometimes tripinnate, 9-18 in. long; pinnae usually opposite. *Leaflets* 3-7 in. each pinna or pinnule, .5-1.5 in. long, ovate-lanceolate, serrate, acuminate, the lateral more or less oblique; petiolule 0.2 in. *Flowers* lilac-blue, in numerous axillary cyme-bearing panicles; peduncles 3-4 in. long. *Calyx* deeply 5-lobed. *Petals* 5, .2-.3 in. long, linear-oblanccolate. *Staminal tube* purple, .2 in. long, cylindrical, with 20-30 linear teeth; anthers at the mouth of the tube. *Ovary* 5-celled. *Drupe* about .5 in. diam., globose, generally 5-celled and 5-seeded, more or less dry, yellow when ripe, at first quite smooth, afterwards wrinkled, remaining on the tree long after ripening.

Very common in cultivation in DEHRA DUN and SAHARANPUR; also in hot valleys in JAUNSAAR,—doubtfully wild.

The tree grows very fast and coppices extremely well. Heart-wood reddish-brown, takes a good polish, and is sometimes used for furniture. “The bark is extremely bitter, and is employed as an anthelmintic. The fruit yields an oil, and the nuts are frequently strung as beads. The leaves and pulp of the fruit are used in native medicine.”—*Mr. J. S. Gamble*. The leaves are also lopped for fodder.

Leafless Dec.-Mar. Fl. Mar.-May. Fr. Cold season.

3. *Cedrela*, Linn.

Deciduous trees. *Leaves* pinnate; leaflets opposite or subopposite. *Flowers* small, in large axillary and terminal panicles. *Calyx* small, 5-fid. *Petals* 5, imbricate, keeled inside at the base. *Disk* thick, 4-6-lobed. *Stamens* 4-6, free, inserted on the top of the disk; fila-

ments subulate; anthers oblong, versatile. *Ovary* 5-celled; style simple; ovules 8-12 in each cell, in two series. *Fruit* an oblong or ovoid capsule, septifragally 5-valved. *Seeds* numerous, flat, winged.

Analysis of the Species.

Leaflets entire; panicles scarcely exceeding the leaves; seeds winged at both ends 1. *C. Toona*.

Leaflets serrate; panicles much exceeding the leaves; seeds winged only at the apex 2. *C. serrata*.

1. **C. Toona**, Roxb.; Fl. Br. Ind. i. 568; Brandis For. Flora 72, Ind. Trees 145; Gamble Man. Ind. Timb. 157. The Toon tree. Vern. *Tún*, Hind.

A large tree with a dense spreading crown and thin dark-grey bark which is smooth up to middle age. *Leaves* paripinnate, 1-2 ft. long, generally glabrous. *Leaflets* 8-30, usually opposite, 2-6 by .7-2.5 in., lanceolate or ovate-lanceolate, acuminate, sometimes pubescent beneath; margins entire, usually wavy; base acute, somewhat oblique; petiolule .3-.7 in. long, slender. *Flowers* cream-coloured, scented like honey, in ample drooping panicles. *Calyx* short; lobes ciliate. *Petals* .15-.2 in. long, free, oblong or ovate, ciliate. *Disk* hairy at the orange-coloured lobes. *Stamens* 5, inserted on the lobes of the disk. *Stigma* capitate, with a large depression at the apex. *Capsule* septifragally dehiscent, .7-1 in. long by .2-.3 in. diam., oblong or oblanceoloid, dark-brown. *Seeds* reddish-brown, light, with a membranous wing at either end, about .5 in. long including the wings.

DÚN and SAHÁRANPUR FORESTS and valleys in the HILLS up to 3,500 ft., generally along the banks of streams or in marshy localities, e.g., Káluwála, Rámgarh, Jogiwála; scarce with Sál. Largely planted in avenues, along canals, and in gardens.

Toon is a fast-growing species, attaining a girth of 60 inches in little more than 30 years. Trees 70-80 ft. in height and 8-10 ft. in girth are not at all uncommon. The heartwood is red, seasons well, takes a fine polish, and is easy to work. It is durable and is not eaten by white ants. Weight about 40 lbs. per c. ft. It is the chief furniture-wood of Dehra Dun and the adjoining districts.

The leaves are sometimes lopped for fodder. A sulphur-coloured dye, *Basanti*, is extracted from the flowers. The bark has astringent properties and is used in medicine.

Leafless Jan., Feb. Fl. Mar.-April. Fr. June, July.

2. *C. serrata*, Royle; Brandis For. Flora 73, Ind. Trees 145; Gamble Man. Ind. Timb. 160. The Hill Toon. Vern. *Darlú*, *Darli*, *Darloi*, Jaunsar.

A moderate-sized tree; bark with regular longitudinal fissures from very early age. *Leaves* usually imparipinnate, 2-3 ft. long. *Leaflets* 12-24 pairs, 3-8 by 1-2.5 in., ovate-lanceolate, acuminate, serrate, glaucous beneath when mature, very unequal-sided at the base; lateral nerves more or less straight; petiolule .1-2 in. long; rachis and midrib of leaflets red until fully mature; base of petiole much flattened. *Flowers* pink, often 6-merous, in lax drooping stringy panicles; 3-5 ft. long (one of the largest inflorescences among Dicotyledons); pedicels rusty tomentose. *Calyx* cup-shaped; lobes obtuse. *Petals* about .2 in. long, oblong, glabrous. *Disk* glabrous. *Stamens* alternating with sterile filaments. *Capsule* about 1 in. long by .5 in. diam., ovoid, acute, dark-grey. *Seeds* winged only at the upper end.

Valleys in JAUNSA and TEHRI-GARHWAL ascending to about 8,000 ft.: Korwá, Binálgádh below Konáin, Dhárágádh, Tons Valley; Morágádh, etc.

Wood light-red or flesh-colour. It is lighter (about 31 lbs. per c. ft.), coarser and more open-grained than that of Toon, from which it is further recognized by its fetid smell. It is used for bridges, for hoops of sieves, for sleepers of sledge-roads, for jhampán-poles and such other purposes. The leaves and young shoots are lopped for cattle-fodder.

Leafless Feb., Mar. Fl. May, June. Fr. July, Aug.

Order 2.—OLACALES.

XXIII. OLACACEÆ.

Trees or shrubs, sometimes climbing, often parasitic upon the roots of other plants. *Leaves* usually alternate, simple, exstipulate. *Flowers* regular, small, 4-

5-merous, 1- or 2-sexual, in cymes or racemes, rarely solitary. *Calyx* small, sometimes accrescent; lobes 0 or tooth-like and small, valvate or imbricate. *Petals* free or more or less coherent, usually valvate. *Stamens* 3-15, free or more or less monadelphous, all fertile or some reduced to staminodes; anthers 2-celled, splitting longitudinally. *Disk* usually hypogynous, cup-shaped. *Ovary* always 1-celled above, imperfectly 3-5-celled below, ovules pendulous from the apex of the central placenta; funicle dilated. *Style* simple or 0. *Fruit* drupaceous, 1-celled, 1-seeded: seed pendulous, albuminous.

1. *Olax*, Linn.

1. *O. nana*, Wall.; Fl. Br. Ind. i. 576; Brandis For. Flora 75, Ind. Trees 148; Gamble Man. Ind. Timb. 163.

An undershrub with a woody rootstock from which annual shoots about 2 ft. high spring up during the rains; stems ribbed. *Leaves* alternate, 1.5-2.5 by .3-.6 in. oblong-lanceolate, subsessile, glabrous and light-green above, glaucous beneath; margins recurved; midrib prominent beneath, straight; lateral nerves indistinct. *Flowers* solitary, .4 in. across; buds ovoid. *Calyx* minute, accrescent. *Petals* 3, oblong-lanceolate. *Fertile stamens* 3, opposite to the petals; staminodes 5-6, bifid, longer than the fertile stamens. *Ovary* 1-celled; style simple, terminal. *Fruit* the size of a pea, globular.

On crests of the SAHÁRANPUR SIWÁLIKs behind Ránipur; rather scarce.

Fl. April, May.

XXIV. ILICACEÆ (AQUIFOLIACEÆ).

Trees or shrubs, generally evergreen. *Leaves* alternate, simple, glabrous, usually coriaceous. *Flowers* small, unisexual and often dioecious, in axillary fascicles or congested cymes. *Calyx* 3-6-cleft, persistent, imbricate.

cate in bud. *Petals* 4-5, white, imbricate, deciduous. *Stamens* 4-5, hypogynous, free or adnate to the petals. *Disk* 0. *Ovary* 3-16-celled; style short. *Fruit* a drupe with 2 or more 1-seeded stones. *Seeds* with a membranous testa.

1. *Ilex*, Linn. .

Leaves coriaceous, serrate; midrib depressed above, prominent beneath. *Flowers* 4-5-merous. *Calyx* small. *Corolla* rotate; petals free or connate at the base. *Stamens* adhering to the base of the corolla. *Ovary* 2-12-celled; style very short or wanting. *Drupe* globose or ovoid, with 2-12 stones.

Analysis of the Species.

Leaves coriaceous, serrate.

- | | |
|-------------------------------------|--------------------------|
| Petiole not exceeding .3 in.; drupe | |
| with 2 stones | 1. <i>I. dipyrrena</i> . |
| Petiole up to .7 in.; drupe with 4 | |
| stones | 2. <i>I. odorata</i> . |

Leaves, membranous, entire.

- | | |
|--------------------------------------|------------------------|
| (Petiole .5-1 in. long; drupe with 5 | |
| stones) | 3. <i>I. Doniana</i> . |

1. *I. dipyrrena*, Wall.; Fl. Br. Ind. i. 599; Brandis For. Flora 76, Ind. Trees 154; Gamble Man. Ind. Timb. 168. The Himalayan Holly. Vern. *Kanderú*, Jaunsar.

A small evergreen tree with rough dark-grey bark. *Leaves* 3-5 by 1-1.7 in., elliptic, ovate or ovate-lanceolate, acute or acuminate, spinous-serrate on young plants, nearly entire on old trees, very coriaceous when fully grown; lateral nerves indistinct; petiole .2-.3 in. long, channelled. *Flowers* .25 in. diam., whitish-green, tetramerous, in round axillary clusters, 2-bracteolate. *Calyx-lobes* broad-ovate, ciliate. *Petals* obovate, connate below in the male, free in the female flowers. *Ovary* small; stigma sessile. *Drupe* .3-.5 in. diam., globose or ellipsoid, red when ripe; stones usually 2, longitudinally grooved.

JAUNSAAR and TEHRI-GARHWAL, 5-9,000 ft. Common about Chakrata and Deoban and elsewhere on limestone soils.

Wood white, hard and close-grained, but cracks in drying and is chiefly used for fuel.

Fl. April-June. Fr. Aug.-Oct.

2. **I. odorata**, Ham.; Fl. Br. Ind. i. 599; Brandis For. Flora 77, Ind. Trees 155; Gamble Man. Ind. Timb. 168.

An evergreen tree; branches rather slender. *Leaves* 4-7 by 1-5-2-5 in., oblong, oblong-lanceolate or oblanceolate, acute or acuminate, very regularly and minutely serrate, thinly coriaceous; lateral nerves somewhat more distinct than in the last species; petiole .3-.7 in. long, channelled. *Flowers* small, white, 4-merous, bracteolate, in short axillary panicles. *Petals* of male flowers connate below, of female flowers free. *Stamens* much longer than the petals. *Ovary* globose, 4-celled; stigma sessile. *Drupe* .2 in. diam., globose, black; stones 4, trigonous.

OUTER HIMALAYA, e.g., below Mussoorie and the Málkot hills; also in the Valley of the Tons in JAUNSAAR and TEHRI-GARHWAL 3,000-4,500 ft. Bháshla Block, Khunigádh, etc.

Fl. April. Fr. June.

3. **I. Doniana**, DC.; Syn.—*I. excelsa*, Wall.; Fl. Br. Ind. i. 603; Brandis For. Flora 76, Ind. Trees 156; Gamble Man. Ind. Timb. 167. Vern. *Túmarí*, U. P.

A middle-sized graceful evergreen tree; bark moderately smooth, silvery-white outside, yellowish and soft inside, with long horizontal wrinkles: young shoots pubescent. *Leaves* 2-4 by 1-25-2 in., elliptic, oblong or ovate, finely acuminate, entire, rather membranous, glabrous and dark-green above, finely grey-pubescent beneath when young, afterwards quite glabrous; lateral nerves about 8 pairs, arcuate; base acute; petiole .5-1 in. long, channelled; stipules minute, caducous. *Flowers* 2-sexual, about .15 in. across, greenish-white, usually 5-merous, in 8-12-flowered axillary pubescent umbels; peduncles .3-.7 in. long, compressed; pedicels about .1 in. long. *Calyx-lobes* ovate, ciliate. *Petals* ovate-orbicular, recurved, united at the base. *Stamens* dilated at the base, as long as the petals, inserted on and alternating with them; anther-lobes ovate. *Stigma* sessile. *Drupe* globose, about .2 in. diam., with 5 3-sided stones.

JAUNSAAR and TEHRI-GARHWAL, 4-6,000 ft.; Kiárigádh below Kathián, Mautárgádh, Lúnágádh, etc. Rather scarce.

Fl. May, June. Fr. Oct., Nov.

Order 3.—CELASTRALES.

XXV. CELASTRACEÆ.

Trees or shrubs, the latter erect or scandent. *Leaves* opposite or alternate, simple, usually coriaceous; stipules minute and caducous, or 0. *Flowers* 2-sexual or polygamous, generally cymose. *Calyx* small, 4-5-lobed, imbricate, persistent. *Disk* conspicuous, sometimes lobed. *Petals* 0 or 4-5, imbricate, inserted on the disk. *Stamens* 3-5, inserted on the disk, alternating with the petals or, when the petals are absent, opposite to the calyx-lobes. *Ovary* 3-5-celled, surrounded by the disk; ovules erect, usually 2 in each cell; style none or short. *Fruit* various. *Seeds* mostly arillate, sometimes winged.

Analysis of the Genera.

Fruit a capsule; seeds arillate.

Leaves opposite 1. *Euonymus*.

Leaves alternate.

Flowers racemose; climbing shrub,

unarmed 2. *Celastrus*.

Flowers cymose; erect trees or shrubs,

often armed 3. *Gymnosporia*.

Fruit a drupe; seeds ex-arillate 4. *Elæodendron*.

1. *Euonymus*, Linn.

Trees or shrubs, the latter rarely scandent. *Leaves* opposite; stipules caducous. *Flowers* 2-sexual, 4-5-merous. *Calyx* flat or recurved. *Disk* broad, fleshy, 4-5-lobed. *Petals* often with coloured veins. *Stamens* inserted on the disk. *Ovary* sunk in the disk; style short. *Fruit* a capsule, 3-5-lobed -angled or -winged, rarely echinate; dehiscence loculicidal. *Seeds* enclosed in a fleshy arillode.

Analysis of the Species.

Erect shrubs or trees. Capsules without prickles.

Flowers (usually) 5-merous.

(Leaves coriaceous; capsules not winged) 1. *E. tingens*

Flowers 4-merous.

Leaves membranous.

Capsules 4-winged 2. *E. lacerus*.

Capsules 4-lobed 5. *E. Hamiltonianus*

Leaves coriaceous; (capsules 4 winged) 4. *E. pendulus*.

Scandent shrub. Capsules covered with prickles; leaves subcoriaceous 3. *E. echinatus*.

1. ***E. tingens***, Wall. ; Fl. Br. Ind. i. 610 ; Brandis For. Flora 79, Ind. Trees 158 ; Gamble Man. Ind. Timb. 172. Vern. *Bhambeli*, *Roini*, Jaunsar.

An evergreen shrub ; bark dark ash-coloured, tubercled or corky, bright-yellow inside. *Leaves* 1·5-3 by ·7-1·3 in., elliptic, oblong or ovate-lanceolate, acute or acuminate, closely serrate or crenate, glabrous, rugose and dark-green above, pale beneath ; lateral nerves faint ; stipules brown, fimbriate ; petiole ·2-3 in. long. *Cymes* dichotomous, axillary or sub-terminal ; peduncles ·5-2 in. long, compressed. *Flowers* usually 5-merous, about ·5 in. diam. *Calyx-lobes* irregularly divided or fimbriate. *Petals* orbicular, dull-white, crenulate, marked with brown or purple veins. *Stamens* shorter than the petals. *Style* subulate. *Capsule* ·5 in. long, globose, 3-5-angled, not winged. *Seeds* enclosed in an orange-coloured arillode.

JAUNSAR and TEHRI-GARHWAL, 6,-10,000 ft. Common at Chakrata, Bodyár, Deoban, Konáin ; Deotá, etc.

The wood is fine-grained, compact and hard, but is seldom used except for fuel ; weight 47 lbs. per c. ft. The corky outer bark of old stems gives a yellow dye.

Fl. April-June. Fr. Aug., Sept.

2. ***E. lacerus***, Ham. ; Brandis For. Flora 78, Ind. Trees 158 ; Gamble Man. Ind. Timb. 171. *Syn.*—*E. fimbriatus*, Wall. ; Fl. Br. Ind. i. 611. Vern. *Lichkoi*, *Angáo* or *Angáu*, Jaunsar.

A small deciduous tree with smooth grey bark ; branchlets reddish-brown, compressed. *Leaves* 1·5-3 by ·8-1·3 in., ovate, acuminate, finely doubly-serrate, membranous, glabrous ; lateral nerves 4-6, very slender ; margins reddish-brown when young ;

petiole .2-.3 in. long; stipules linear, deciduous. *Cymes* umbelliform, mostly from the base of current year's shoots; peduncles 1-3 in. long, with 3-7 very slender branches; pedicels capillary. *Flowers* .15 in. diam., tetramerous. *Petals* cream-colour, ovate, entire. *Anthers* on short filaments. *Capsule* .3-.5 in. diam., globose; wings usually 4, .3 in. long, tapering. *Seeds* ovoid, enclosed in a red arillode.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, 6-10,000 ft., generally affecting shady aspects—Deoban, Konáin, Mundáli, etc.

Wood white, compact, tough, close- and even-grained; weight about 48 lbs. per c. ft. It is carved into spoons. The leaves and branches are lopped for fodder. The seeds are often strung up as beads.

Fl. April, May. Fr. Aug., Oct.

3. *E. echinatus*, Wall.; Fl. Br. Ind. i. 611; Brandis For. Flora 80, Ind. Trees 158; Gamble Man. Ind. Timb. 170. Vern. *Láduli*, Garhwal.

A climbing shrub adhering to rocks and trees by dense tufts of adventitious roots; shoots quadrangular. *Leaves* variable, .5-3 by .2-1 in., ovate or oblong-lanceolate, acute, crenate or obtusely serrate, subcoriaceous, glabrous; main lateral nerves 8-10 pairs, prominent beneath, joining into an intramarginal vein; petiole margined, of the largest leaves .3 in. long. *Flowers* about .2 in. diam., greenish, in short axillary cymes. *Capsule* .3 in. diam., globose, covered with dark-coloured spines.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, 7-10,000 ft. Deoban, Bhújkoti, Mundáli, Deotá, etc.

Fl. Mar., April. Fr. Aug., Sept.

4. *E. pendulus*, Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 79, Ind. Trees 159; Gamble Man. Ind. Timb. 172. Vern. *Bhambéla*, Jaunsar.

A small evergreen tree or large shrub with a short trunk, numerous spreading branches and pendulous branchlets; bark grey, corky. *Leaves* 3-5 by 1-1.5 in., oblong-lanceolate, equally acute at both ends, sharply serrate, coriaceous, glabrous, shining above; lateral nerves indistinct; midrib pale, prominent; petiole .3-.4 in. long, channelled; stipules minute. *Cymes* axillary or supra-axillary; peduncles 1-2 in. long, much compressed. *Flowers* .3-.5 in. diam., 4-merous. *Calyx-lobes* obtuse, fimbriate. *Petals* about .2 in. long, oblong, whitish, fimbriate. *Stamens* short;

anthers ovate. *Style* short, filiform. *Capsule* .5 in. diam., 3-4-lobed and sharply angled, more or less winged; arillode reddish-orange.

Open shady aspects and ravines in JAUN SAR and TEHRI-GARHWAL, ascending to 8,500 ft.—Korwá forest, Tutuá and Bárnai Gádhs, Konáin; Lambátách, etc. Very common about Mussoorie.

Wood close- and even-grained; weight 35-40 lbs. per c. ft. It is, however, rarely used except for fuel.

Fl. April, May. Fr. June, July.

5. **E. Hamiltonianus**, Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 78, Ind. Trees 159; Gamble Man. Ind. Timb. 171. Vern. *Dádúl*, *Dhárúá*, Jaunsar.

A large deciduous shrub with a thick corky ashy-grey bark. Leaves variable, 2-6 by .7-1.7 in., oblong or ovate-lanceolate, acuminate, finely serrate, membranous, glabrous, dull-green, not shining; petiole .3-.5 in. long. *Cymes* dichotomous, axillary or intra-axillary; peduncles about 7-flowered. *Flowers* about .3 in. diam., greenish-white. *Petals* .2-.3 in. long, lanceolate or strap-shaped, margins revolute. *Stamens* and *style* .1 in. long. *Capsule* .2-.4 in. diam., turbinate, deeply 3-4-lobed, yellow when ripe. *Seeds* enclosed in a scarlet arillode.

TEHRI-GARHWAL, 8-9,000 ft., generally in shady localities; Kotigádhs, Bálichá, etc. Rather scarce in JAUN SAR; Agragádhs near Deoban; also Bodyár.

Wood white, soft and close-grained, used for carving into ladles. Weight about 40 lbs. per c. ft. The branches are lopped for fodder.

Fl. Mar.-May. Fr. Aug.-Nov.

2. **Celastrus**, Linn.

Climbing shrubs. *Leaves* alternate; stipules minute, deciduous, sometimes 0. *Flowers* small, 4-5-merous, polygamous. *Disk* broad. *Petals* usually spreading. *Stamens* inserted on the margins of the disk. *Ovary* 3-celled, not immersed in the disk, with 2 ovules in each cell; *style* short; *stigma* 3-lobed. *Fruit*

a globose or obovoid loculicidal capsule, 1-3-celled. *Seeds* 1-2 in each cell, more or less enveloped in an aril.

C. paniculata, Willd. ; Fl. Br. Ind. i. 617 ; Brandis For. Flora 82, Ind. Trees 162 ; Gamble Man. Ind. Timb. 175. Vern. *Málkāngui*, *Málkāni*, Hind.

A large woody climber with corky bark ; young shoots marked with lenticles. *Leaves* very variable in size and shape, generally 2-4 by 1-5-3 in., obovate orbicular elliptic or oblong-lanceolate, short-acuminate, crenate, more or less coriaceous, glabrous ; base acute ; lateral nerves 4-6 pairs, parallel to the margins ; petiole 4-6 in. long. *Panicles* terminal, large, drooping, pubescent, branching into compound cymes. *Flowers* 1-5 in. across, pale-green. *Calyx-lobes* rounded, toothed. *Petals* oblong. *Anthers* large, about the size of the petals. *Ovary* free ; stigma simple. *Capsule* 4-5 in. diam., globose, usually 3-celled, bright-yellow when ripe. *Seeds* 1-2 in each cell, black, enclosed in a red arillus.

Common in the DÚN and SAHÁRANPUR FORESTS, also at low elevations in JAUNSAH and the OUTER HIMALAYA. It has a striking appearance when in fruit, which hangs gracefully like bunches of yellow beads.

The leaves and seeds are used in country medicine. An oil is extracted from the seeds which is believed to have great medicinal virtue, and is also used for burning.

Fl. April-June. Fr. Cold season.

C. stylosa Wall. ; Fl. Br. Ind. i. 618 ; Brandis Ind. Trees 162—has also been collected at Dehra Dun. It is supposed to differ from *C. paniculata* Willd. by the flowers being in shorter racemes, and the style being 3-lobed, while in *C. paniculata* the flowers are in panicles and the style is not lobed.

3. *Gymnosporia*, W. & A.

Shrubs or small trees, usually thorny. *Leaves* alternate, exstipulate. *Flowers* hermaphrodite, in axillary, solitary or fascicled dichotomous cymes ; sometimes on the thorny branchlets. *Calyx* 4-5-lobed. *Petals* 4-5. spreading. *Stamens* as many as petals,

inserted below the disk; *filaments* slender; *anthers* broad. *Disk* broad, sinuate or lobed. *Ovary* more or less sunk in the disk, 2-3 celled; *ovules* 2 in each cell; *style* short; *stigmas* 2-3. *Capsule* usually obovoid, 2-3-celled, 1-6-seeded. *Seeds* usually arillate, rarely ex-arillate.

1. **G. Royleana**, Wall.; Fl. Br. Ind. i. 620; Brandis Ind. Trees 163. *Celastrus spinosa*, Royle; Brandis For. Flora 80; Gamble Man. Ind. Timb. 176. Vern. *Gwāla Dūrim*, Hind.

A thorny shrub 8-10 ft. high; bark thin, grey, corky; spines .5-1 in. long, axillary, straight, slender. *Leaves* .5-2 by .3-1.2 in., obovate or ovate, serrate, crenate or subentire, coriaceous, very slightly pubescent when young, lateral nerves faint; tip acute rounded or emarginate; petiole .1-2 in. long. *Cymes* axillary shorter than the leaves; pedicels slender. *Calyx-lobes* ciliate. *Petals* .1 in. long, whitish, ovate-oblong. *Ovary* sunk in the fleshy disk. *Capsule* .2-3 in. diam., turbinate, 3-cornered; seeds partially covered with a white aril.

Banks of the Jumná near Dākhpathār, also Āmbāri, in the DŪN; and Bādshāhibāgh and Khārā in the SAHĀRANPUR DISTRICT. It is likely to be mistaken for *Flacourtia Ramontchi*, which it closely resembles in foliage and general appearance.

Fl. and Fr. almost throughout the year, but more generally in the cold season.

4. *Elæodendron*, Jacq. fil.

1. **E. glaucum** Pers.; Fl. Br. Ind. i. 623; Brandis Ind. Trees 164. Syn.—*E. Roxburghii*, W. & A.; Brandis For. Flora 82; Gamble Man. Ind. Timb. 178. Vern. *Dhebri*, Hind.; *Jangēla*, Jang'l, E. DŪN; *Pāniāla*, W. DŪN.

A moderate-sized or large tree, often with reddish branchlets; bark dark-grey, smooth, blood-red inside, exuding when cut a profuse watery sap from the cambium-layer. *Leaves* opposite or sub-opposite; less frequently alternate, 2-6 by 1-3 in., elliptic ovate oblong or obovate, acuminate, crenate sub-coriaceous, glabrous, dark-green and shining above, glaucous beneath (whence the specific name); main lateral nerves about 10 pairs, slender; petiole .4-1 in. long, channelled. *Cymes* axillary, dichotomous, 3-5 in.

long; peduncle 1.2-5 in. long, often red. *Flowers* .2 in. diam., whitish. *Calyx* 4-5 cleft; segments obtuse. *Disk* fleshy. *Petals* 4-5, about .1 in. long, oblong. *Stamens* 4-5, short, inserted under the edge of the disk; filaments recurved. *Ovary* adnate to the disk; style very short. *Fruit* a dry obovoid drupe, .4-.6 in. long, 1-celled, 1-seeded, tipped with the persistent style, mostly sterile (reproduction chiefly by root-suckers).

DEHRA DUN AND SAHARANPUR DIVISIONS also in valleys in the HILLS, generally affecting a clayey binding soil, and consequently with *sáin* in *Sál* forests—Tháno, Lachiwála, Karwápáni, Timli Pass, Dholkhand, Ránipur, Kálsi, etc.

Wood moderately hard, even- and close-grained, deep-red when fresh-cut, turning light-brown in seasoning; weight 40-50 lbs. per c. ft. It takes a fine polish, and is used for cabinet-work and picture-frames. Forest contractors in the Dún generally convert it into karries, which are exported into the plains districts and sold there as *Sál*. "The root is believed to be a specific for snake-bites, and the bark is used in native medicine."—*Sir D. Brandis*.

Leafless in April. Fl. April-June. Fr. Jan.-June of the next year.

XXVI. RHAMNACEÆ.

Trees or shrubs, often armed. *Leaves* simple, generally alternate; stipules small, sometimes changed into prickles. *Flowers* 1-sexual or polygamous, green or yellow, small, usually in axillary cymes. *Calyx* 4-5 cleft, sometimes superior; lobes triangular, valvate in bud. *Petals* 4-5 or 0, involute, inserted on the throat of the calyx-tube, alternating with and generally shorter than the calyx-segments. *Disk* various. *Stamens* 4-5, opposite to the petals and often enclosed within their folds; anthers versatile. *Ovary* free or more or less immersed in the disk, usually 3-celled, with one erect ovule in each cell; styles united. *Fruit* various, generally indehiscent; seeds 1-4.

Analysis of the Genera.

Ovary superior or half-superior.

Scandent shrubs. Fruit terminating in a long wing 1. VENTILAGO.

Generally erect shrubs. Fruit not winged.

Disk thick, filling the calyx-tube.

Leaves more or less oblique, 3-5-nerved at the base.

Armed. Fruit with a 1-4-celled stone; peduncle not thickened . . . 2. ZIZYPHUS.

Unarmed. Fruit 3-seeded; peduncle thickened in fruit . . . 5. HOVENIA.

Leaves symmetrical, penninerved.

Leaves alternate; drupe 2-celled, 2-seeded 3. BERCHEMIA.

Leaves opposite or sub-opposite; fruit 3-celled, 3-seeded . . . 6. SAGERETIA.

Disk thin, lining the calyx-tube.

(Leaves symmetrical, alternate; fruit 2-4-seeded) 4. RHAMNUS.

Ovary inferior. Cirrrose climbing shrubs.

Flowers racemed; fruit winged . . . 7. GOUANIA.

Flowers umbelled; fruit not winged . . . 8. HELINUS.

1. *Ventilago*, Gaertn.

1. *V. calyculata*, Tulasne: Fl. Br. Ind. i. 631; Brandis For. Flora 96. Ind. Trees 168; Gamble Man. Ind. Timb. 180. Vern. *Kāli-bel*, Dūn.

A large woody climber generally with strong tendrils; branchlets pubescent; bark dark-grey. *Leaves* 2-4 by 1-2·5 in., ovate- or oblong-elliptic, more or less acute, crenate or entire, subcoriaceous, pubescent when young; lateral nerves 6-8 pairs, arcuate; base unequal; petiole 2-4 in., pubescent. *Flowers* numerous, small, greenish, in large terminal panicles. *Calyx* pubescent; lobes 5, keeled inside. *Petals* 5, reflexed. *Disk* 5-lobed, filling the calyx-tube. *Ovary* 2-celled, sunk in the disk; style short, prolonged and winged on both sides in fruit. *Fruit* a sub-globose nut, about 2 in. diam., girt about the middle by the rim of the adherent calyx-tube and prolonged into a wing which is 1-1·5 by 3-4 in., linear, strongly reticulate and with a prominent straight midrib.

Shady mixed forests and ravines in SAHÁRANPUR and the DŪN;—Kasūmri, Chillāwāla; Thāno, Kāluwāla, Nakraunda, Lachiwāla, Dūdhli, Rāiwāla, Khairi, etc.

Wood pale-yellow, tough, capable of being used for fuel.

Fl. Feb., Mar. Fr. May, June.

2. *Zizyphus*, Juss.

Trees or shrubs, sometimes sarmentose, usually armed with stipulary prickles. *Leaves* alternate, more or less distichous, subcoriaceous, 3-5-nerved at the base. *Flowers* small, in axillary fascicles or cymes. *Calyx* 5-fid; lobes keeled within. *Petals* 5 or 0, deflexed. *Disk* 5-10-lobed, coating the calyx-tube; edges free. *Stamens* 5. *Ovary* immersed in the disk and adnate to it at the base, 2-4-celled; styles 2-4, free or partly connate. *Fruit* a fleshy or dry drupe with a hard 1-4-celled and 1-4-seeded stone.

Analysis of the Species.

Flowers fascicled or in sessile cymes.

Leaves broad-ovate or suborbicular,
felted beneath.

Tree. Drupe over .5 in. diam. 1. *Z. Jujuba*.

Shrub. Drupe about .3 in. diam. var. *fruticosa*.

Leaves ovate-lanceolate, acuminate;
drupe about .3 in. diam.

An erect shrub. Leaves wholly glabrous; prickles usually in pairs 2. *Z. oxyphylla*.

An straggling shrub. Leaves hairy on both surfaces; prickles solitary 3. *Z. Enoplia*.

Flowers in peduncled cymes; leaves generally obtuse, glabrous above.

Cymes short, simple; drupe 1 in. diam., dry, tomentose, 3-celled 4. *Z. xylopyra*.

Cymes long, panicle; drupe .3 in. diam., fleshy, glabrous, 1-celled 5. *Z. rugosa*.

1. ***Z. Jujuba***, Lam.; Fl. Br. Ind. i. 632; Brandis For. Flora 86, Ind. Trees 170; Gamble Man. Ind. Timb. 181. Vern. *Ber*, *Beri*, Hind. The cultivated variety is called *Pewandi* or *Pemdi Beri*.

A moderate-sized tree, almost evergreen; bark dark-grey or nearly black, with long deep vertical cracks, reddish and fibrous inside; young parts rusty-tomentose. *Leaves* very variable, 1-4 by .6-3 in., suborbicular, elliptic or ovate, closely serrulate or entire, rounded at both ends, dark-green glabrous and often shining above, densely woolly-tomentose beneath; base more or less oblique, strongly 3-nerved, nerves closely penniveined; petiole .1-6 in. long; prickles solitary or in twos. *Flowers* greenish-yellow, in short axillary cymes or fascicles, scarcely exceeding the petioles. *Calyx* glabrous within. *Petals* concave, reflexed. *Disk* 10-lobed. *Ovary* 2-celled; styles 2. *Drupe* 2-celled, very variable in size and shape, over .5 in. long, globose to ellipsoidal or obovoid-acuminate, red or orange when ripe.

Extremely common and gregarious along the foot of the SAHÁRANPUR SIWÁLIKs, especially at Beribára. The *Powandi Beri* is cultivated in gardens, especially in SAHÁRANPUR.

Wood hard, compact, tough, reddish; annual rings not distinct; weight 43-52 lbs. per c. ft. It is used for agricultural implements, and is very good for fuel and charcoal. The fruit is eaten. Lac is produced on its branches. The branches and leaves are lopped for fodder.

Fl. Sept.-Nov. Fr. Dec.-Feb.

Var. *fruticosa*, Haines, vern. *Jhar Beri*, Hind., a much-branched thorny shrub about 3-4 ft. high with smaller leaves and fruit. It is very common in grass-lands in the Dun.

2. **Z. oxyphylla**, Edgew.; Fl. Br. Ind. i. 634; Brandis For. Flora 85, Ind. Trees 171; Gamble Man. Ind. Timb. 183. Vern. *Beri*, Jaunsar.

A thorny shrub, usually with a few scattered hairs on young parts, otherwise quite glabrous; bark thin, brown. *Leaves* 1-2 by .7-1.3 in., ovate-lanceolate, gradually acuminate, mucronate, finely serrate, rather membranous, glabrous; base subcordate, oblique, 3-nerved; petiole .2-4 in. long, slender; prickles weak, usually in twos, one of which points upward. *Flowers* pale, in axillary fascicles, about .15 in. diam.; pedicels slender, .2-3 in. long. *Calyx-lobes* triangular, acute. *Petals* clawed. *Disk* thin, 5-lobed. *Ovary* 2-celled; styles 2, united to beyond the middle. *Drupe* about .3 in. long, ovoid, fleshy, 2-celled and 2-seeded, less frequently 1-celled and 1-seeded, orange-red when ripe but drying black; seeds brown, plano-convex.

Up to 6,000 ft. in JAUNSAAR and TEHRI-GARHWAL, generally round villages and in open valleys: Binálágádh, Dhármigádh, Siligádh, etc.

Wood white, moderately hard. It is often planted in hedges and also for its acid fruit which tastes like tamarind.

Fl. May, June. Fr. Oct., Nov.

3. **Z. Oenoplia**, Mill. ; Fl. Br. Ind. i. 634 ; Brandis For. Flor.^a 86, Ind. Trees 170 ; Gamble Man. Ind. Timb. 183. Vern. *Makôh* Saháranpur.

A thorny shrub with long sarmentose branches ; bark rough, dark-grey. *Leaves* 1·2 by ·7-1 in., very obliquely ovate-lanceolate, mucronate, obscurely crenate-serrate or subentire, more or less pubescent above, softly rusty-tomentose beneath ; base 3-4 nerved ; petiole 1-3 in. long, pubescent, rather stout ; prickles small, recurved, generally solitary. *Cymes* dichotomous, compressed. *Calyx* tomentose outside. *Petals* obtriangular. *Ovary* 2-celled : styles 2, united to above the middle. *Drupe* about ·25 in. diam. sub-globose or ovoid, black when fully ripe, with a scanty mealy acid pulp, 2-celled, 2-seeded, but generally 1-celled and 1-seeded by abortion.

Common along the foot of the SAHÁRANPUR SIWALIKS, somewhat rare in the DŪN, being found only about Pardūni.

The long branches are much in demand for fencing round fields, and the plant is often grown in hedges. The fruit is eaten.

Fl. April, May. Fr. Cold season.

4. **Z. xylopyra**, Willd. ; Fl. Br. Ind. i. 634 ; Brandis For. Flora 90. Ind. Trees 171 ; Gamble Man. Ind. Timb. 183. Vern. *Bhander*, *Kath Ber*, Dūn and Saháranpur.

A large erect shrub ; branches more or less straggling ; young shoots rusty-tomentose ; bark thin, brownish-grey, smooth or rough with small exfoliating scales. *Leaves* 1-3·5 by ·7-2·5 in., orbicular, broadly elliptic or obovate, serrulate, obliquely sub-cordate or rounded at the base, tip rounded or acute, slightly pubescent along the nerves, otherwise glabrous above, brown-pubescent beneath ; petiole 1-3 in., tomentose ; prickles usually in twos, one straight, the other recurved, often wanting. *Cymes* axillary, peduncled. *Flowers* scarcely ·1 in. diam. *Calyx-lobes* keeled only at the apex. *Petals* reflexed. *Disk* thin, 5-angled. *Ovary* usually 3-celled ; styles 3, almost free. *Drupe* about 1 in. diam., globose, often depressed at the ends, more or less white-tomentose, 3-celled, dry, not edible.

Common in the DŪN and SAHÁRANPUR DISTRICTS, generally in scrub forests, but is sometimes also found with Sál.

Wood yellowish-brown, hard and durable, also easy to work but is seldom used except for fuel ; weight about 50 lbs. per c. ft.

The bark is used for tanning, and the leaves for fodder. The fruit is used to give a black dye to leather.

Leafless Mar., April. Fl. April, May. Fr. Cold season.

5. *Z. rugosa*, Lam. : Fl. Br. Ind. i. 636 ; Brandis For. Flora 89, Ind. Trees 171 ; Gamble Man. Ind. Timb. 184. Vern. *Bhand, Ber*, Dún.

A small evergreen tree ; branches few, somewhat straggling ; young parts generally rusty-tomentose, bark dark-grey or nearly black, deeply cracked into thick rectangular scales. *Leaves* 2-4 by 1-7-3-5 in., sub-orbicular ovate or elliptic, closely serrulate, sub-acute, obliquely rounded or sub-cordate at the base, dark-green and glabrous above, thickly grey or rusty-felted beneath ; basal nerves 3, each closely penniveined ; petiole .2-.3 in. long, stout ; prickles few, usually solitary, recurved. *Cymes* arranged in long axillary or terminal panicles which are often 1 ft. long, rusty-tomentose throughout. *Calyx-lobes* not keeled. *Petals* 0. *Disk* 5-angled, hairy. *Ovary* 2-celled ; styles 2, united below the middle. *Drupe* about .3 in. long, globose or pyriform, 1-celled, 1-seeded.

Along the foot of the Nágsidh Hill and at Rámgarh in the Dún, also in valleys in the HILLS up to 3,000 ft. ; not very common.

Wood reddish, moderately hard, but warps and is liable to be attacked by insects. It is used chiefly for fuel. The fruit is eaten and the leaves are lopped for fodder.

Fl. Mar., April. Fr. Rainy season.

3. *Berchemia*, Neck.

Unarmed erect or climbing shrubs. *Leaves* alternate, closely penninerved. *Flowers* usually 5-merous and 2-sexual. *Calyx* persistent. *Petals* usually obovate or oblanceolate. *Disk* lining the calyx-tube. *Ovary* 2-celled, sunk in the calyx-tube, but not adnate to it. *Fruit* a drupe or a berry, usually tipped with the remains of the style ; kernel 2-celled, 2-seeded.

Analysis of the Species.

A climbing shrub. Leaves 2-4 in. long . 1 *B. floribunda*.

An erect undershrub. Leaves about

.5 in. long 2. *B. lineata*.

1. **B. floribunda**, Wall.; Fl. Br. Ind. i. 637. Brandis For. Flora 91, Ind. Trees 169; Gamble Man. Ind. Timb. 184. Vern. *Kouloi* or *Káuloi*, Jaunsar; *Amili*, Garhwal.

A large climbing shrub; bark thin, whitish outside, inner layer purple. *Leaves* 2-4 by 1-2 in., ovate or oblong, acuminate, thinly sub-coriaceous, glabrous, rounded or sub-cordate at the base; lateral nerves 10-12 pairs, straight, parallel, slender but distinct; petiole .5-7 in. long, terete; stipules 2-fid. *Flowers* minute, "3-10 in cymose clusters, arranged in racemes 2-3 in. long, which again form large terminal panicles."—*Sir D. Brandis*. *Fruit* .3-5 in. long, ovate-oblong or cylindrical, fleshy.

Swampy localities in the DŪN, e.g., Káluwála, Nakraunda Jogiwála, etc., and in shady ravines up to 4,500 ft. in the HILLS, e.g., Binalgádh, Chátrágádh, etc.

Fl. May-July. Fr. Feb.-April.

2. **B. lineata**, DC.; Fl. Br. Ind. i. 638; Brandis For. Flora 91, Ind. Trees 169; Gamble Man. Ind. Timb. 184. Vern. *Angári*, Jaunsar.

An undershrub 2-5 ft. high, with smooth shining bark; young shoots puberulous. *Leaves* variable, generally about .5 in. long, oblong or ovate, elegantly marked underneath with 6-8 pairs of fine straight nerves; petiole .1-2 in. long, slender; stipules bristle-like. *Flowers* minute, in axillary or terminal clusters. *Calyx-lobes* linear. *Petals* linear-lanceolate. *Berry* .25-.4 in. long, cylindrical, blue when ripe.

JAUNSAR and TEHRI-GARHWAL, 8-9,000 ft.; not very common. Bájámára; below "Snow View" and at Kanjátra, Deoban, etc.

Fl. May-July. Fr. Sept.

B. Edgeworthii, Lawson; Fl. Br. Ind. i. 638; Brandis Ind. Trees 169; a shrub closely resembling the above, but with glabrous branches, 6-merous flowers, and somewhat larger leaves and fruit. has also been found in JAUNSAR and TEHRI-GARHWAL, e.g., Durani Dhár, Oshlá, Kanjátra, etc. This is probably not really different from *B. lineata*, DC. and has been included under that species by Mr. Parker in his Flora for the Punjab.

4. **Rhamnus**, Linn.

Shrubs or trees, sometimes with spinescent branches. *Leaves* alternate or fascicled (by the arrest of the

growth of the branchlets), penninerved. *Flowers* unisexual or polygamous, in axillary fascicles or cymes. *Calyx* 4-5 fid; lobes keeled within. *Disk* thin, lining the calyx-tube. *Petals* 4-5 or 0. *Stamens* 4-5, inserted with the petals on the edge of the disk; filaments short. *Ovary* free, 3-4-celled, narrowed into a 3-4-celled style; stigma papillose. *Fruit* a berry-like drupe, 2-4-celled, 2-4-seeded, seated on the persistent calyx-tube.

Analysis of the Species.

Erect shrubs or trees.

Spinescent shrubs. Leaves mostly fascicled; flowers 4-merous.

Leaves sub-coriaceous, alternate on growing shoots; stem ash-coloured.

Leaves membranous, sub-opposite on growing shoots; stem shining dark-grey.

1. *R. persica*.

2. *R. virgata*.

Unarmed shrubs. Leaves not fascicled; flowers 5-merous.

Leaves membranous; branchlets purple; cymes sessile.

3. *R. purpurea*.

Leaves sub-coriaceous; branchlets green; cymes racemed.

4. *R. triquetra*.

A prostrate shrub, not armed.

(Leaves coriaceous; flowers 5-merous) 5. *R. procumbens*.

1. ***R. persica***, Boiss.; Fl. Br. Ind. i. 638; Brandis For. Flora, 93; Gamble Man. Ind. Timb. 185. Vern. *Chirla*, Dún.

A deciduous shrub with a short erect trunk and stiff branches, often armed; bark smooth, ash-coloured; epidermis peeling off generally in vertical strips. *Leaves* alternate on growing shoots, fascicled on arrested branchlets, .5-2 in. long, ovate, elliptic lanceolate or obovate, acute acuminate or rounded at the tip, minutely serrulate or entire, sub-coriaceous, slightly tomentose beneath; petiole minute to .3 in. long. *Flowers* 4-merous, short-pedicelled, dioecious, in axillary fascicles. *Petals* small, linear. *Fruit* about .2 in. diam., obovoid or turbinate.

In the DÚN at Mothronwala, and near the Harbanswála Chauki; also in JAUNSAH up to 8,000 ft., e.g., Saia, the slopes below Konain village, etc.

The fruit is eaten, and the leaves are browsed by goats.

Fl. Mar.-May, before the new leaves, but generally throughout the year. Fr. Chiefly Nov., Dec.

2. **R. virgata**, Roxb.; Brandis For. Flora 92, Ind. Trees 172; Gamble Man. Ind. Timb. 185. Syn.—*R. dahurica*, Pall., Fl. Br. Ind. i. 639. The Himalayan Buckthorn. Vern. *Thanthār*, Jaunsar; *Chaurdhā*, Garhwal.

A deciduous shrub or small tree, generally with a stout spine at the forks of the branches; bark dark-grey, thin, smooth, shining, peeling off in horizontal rolls. *Leaves* generally sub-opposite on growing shoots, fasciated on arrested branchlets, .5-2 by .2-1 in., rhomboidal ovate or ovate-lanceolate, acuminate, minutely serrulate or entire, membranous, slightly pubescent beneath when young; lateral nerves 3-5 pairs, slender; base acute; petiole .1-.4 in. long. *Flowers* 4-merous, in dense axillary fascicles; buds pointed; pedicels long or short, filiform. *Calyx*-tube campanulate. *Petals* minute. *Fruit* about .15-.25 in. diam., globose.

Common in JAUNSAR and TEHRI-GARHWAL between 3,000 and 9,000 ft., also along the Bindāl nālā, DEHRA DŪN.

The wood is hard and close-grained; weight 56 lbs. per c. ft. Capable of being used for agricultural implements. "The fruit is bitter, emetic and purgative, and is given in affections of the spleen"—*Mr. J. S. Gamble*.

Fl. April-June. Fr. Cold season. Often fl. and fr. throughout the year.

3. **R. purpurea**, Edgew.; Fl. Br. Ind. i. 639; Brandis For. Flora 91, Ind. Trees 173; Gamble Man. Ind. Timb. 186. Vern. *Luhish*, *Lhish*, Jaunsar.

An unarmed deciduous shrub; bark thin, smooth. *Leaves* alternate, 2-4 by 1-2 in., elliptic or ovate-lanceolate, acuminate, serrate or crenate, membranous, pubescent beneath when young; lateral nerves 6-10 pairs, somewhat arcuate, prominent. *Flowers* 2-sexual, 5-merous, in short axillary cymes; buds ovoid. *Calyx* cup-shaped; segments acute. *Petals* usually 0. *Style* short, 3-cleft. *Drupe* about .2-.3 in. diam., sub-globose or pyriform.

JAUNSAR and TEHRI-GARHWAL, between 4,500 and 9,500 ft. Common at Deoban, Mundāli; Deotā, etc., generally on open shady aspects.

Wood brownish-grey, close-grained; weight 41 lbs. per c. ft. The fruit is used as a purgative.

Fl. May, June. Fr. July-Oct.

4. **R. triquetra**, Wall. ; Fl. Br. Ind. i. 639 ; Brandis For. Flora 92, Ind. Trees 173 ; Gamble Man. Ind. Timb. 186. Vern. *Katherú*, Jaunsar ; *Gaunt*, Dún and Garhwal.

An unarmed deciduous shrub : bark dark-grey, thin. *Leaves* 2-6 by 1-2 in., ovate-oblong, acuminate, closely serrate, glabrescent above, finely pubescent beneath, somewhat brittle, drying yellowish-green, often mixed with smaller leaves which are .5-1 in. long ; lateral nerves 8-10 pairs, arcuate ; base rounded or acute ; petiole .3-1 in. long. *Racemes* of cymes 2-4 in. long, axillary, sometimes, with a few leaf-like small bracts. *Flowers* puberulous. *Calyx*-lobes acute. *Petals* clawed, emarginate, sheathing the stamens. *Drupe* 3-lobed.

OUTER HIMALAYA and JAUNSAIR, 3,-6,000 ft. Common below Mussoorie and also about Tiuni in the Tons Valley. MÁLKŌT HILLS down to Tháno in the DÚN ; also near Ambári. Also found in the SIWALIKS, *e.g.*, in the Timli Pass.

Wood yellowish-brown, hard and close-grained, capable of being used for agricultural implements.

Fl. July, Aug. Fr. Oct.-Dec.

5. **R. procumbens**, Edgew. ; Fl. Br. Ind. i. 640 ; Brandis For. Flora 93, Ind. Trees 173 ; Gamble Man. Ind. Timb. 187.

A small procumbent shrub, usually trailing on rocks ; young branches pubescent. *Leaves* .3-1 in., elliptic or lanceolate, acute or acuminate, serrulate, coriaceous, dark-green ; midrib prominent beneath, depressed above ; lateral nerves faint ; petiole of the largest leaf about .1 in. long ; stipules setaceous, persistent. *Flowers* axillary, often solitary, on slender pedicels which are .2-.5 in. long. *Fruit* about .15 in. diam., globose, fleshy.

JAUNSAIR, 7,000 to 8,500 ft. Common on rocks at Matkángará and in the Mohná Block, Deoban ; Tutuá Block, Mundáli, etc.

Wood yellowish, hard, close grained and tough.

Fl. July, Aug. Fr. May, June (next year).

5. **Hovenia**, Thunb.

1. **H. dulcis**, Thunb. ; Fl. Br. Ind. i. 640 ; Brandis For. Flora 94, Ind. Trees 174 ; Gamble Man. Ind. Timb. 187

A small deciduous tree with a straight trunk. *Leaves* alternate, 4-6 by 2-3.5 in., ovate, long-acuminate, often inequilateral, serrate, membranous, glabrescent above, more or less tomentose beneath, 3-nerved at the base ; lateral nerves 3-5 pairs above the

basal; petiole .5-.7 in. long. *Flowers* 2-sexual, white, in axillary and terminal dichotomous cymes; peduncle 1-2 in. long. *Calyx* 5-fid; tube conical, deciduous. *Petals* 5, clawed. *Disk* fleshy, woolly. *Stamens* 5, longer than the petals, inserted on the edge of the disk. *Ovary* 3-celled, sunk in the disk; styles 3. *Fruit* a 3-celled, 3-seeded, indehiscent drupe, about .3 in. diam.; the peduncle and part of the inflorescence thicken into a fleshy mass when the fruit ripens.

JAINSAK and TEHRI-GARHWAL, 3,000 to 6,500 ft.: Thadiár, Bámsu, Dárnagádh, etc.

The fleshy peduncle is sweet and aromatic, and is eaten. The leaves are eaten by cattle.

Fl. April-June. Fr. July-Sept.

6. *Sageretia*, Brongn.

1. *S. oppositifolia* Brongn.: Fl. Br. Ind. i. 641; Brandis For. Flora 95, Ind. Trees 173; Gamble Man. Ind. Timb. 188. Vern. *Gonta*, E. Dún.

A shrub or small tree with long subscentent spinous branches; branchlets tomentose when young. *Leaves* usually opposite, 2-4 by 1-1.5 in., those towards the end of the branches usually much smaller, ovate-lanceolate, acute or acuminate, serrate or sub-entire, sub-coriaceous, glabrescent above, pubescent (at least along the nerves) beneath; lateral nerves 5-8 pairs, impressed above, prominent beneath; base rounded, rarely subcordate; petiole .5 in. *Flowers* very small, in large terminal panicles with opposite racemose ramifications, often mixed with small membranous leaves. *Calyx* flat, 5-toothed. *Petals* 5, clawed, hooded. *Disk* cup-shaped, lining the calyx-tube. *Stamens* 5, as long as the petals. *Ovary* 3-celled, narrowed into three coherent styles. *Fruit* berry-like, turbinate, .2-.3 in. diam., black when ripe.

Throughout the OUTER HIMALAYA, 3-, 6,000 feet.: Málkôt, Jákhán Canal, below Mussoorie, Sahansra-dhárá, Saiá, Korwá, etc.

The wood is tough and is sometimes used for axe-handles. The fruit is edible.

Fl. July-Sept. Fr. April-June.

7. *Gouania*, Linn.

1. *G. leptostachya*, DC.; Fl. Br. Ind. i. 643; Brandis For. Flora 574, Ind. Trees 175; Gamble Man. Ind. Timb. 189.

An unarmed climbing shrub bearing tendrils at the ends of the branchlets. *Leaves* alternate, 2-4 by 1.5-2.5 in., ovate, acuminate, crenate, sub-coriaceous, more or less rusty-pubescent beneath when young; lateral nerves 5-6 pairs, often opposite, arcuate, the lowest pair from near the base; base rounded or sub-cordate; petiole .3-.6 in. long. *Flowers* white, about .15 in. diam., in axillary or terminal often leaf-bearing racemes which are 6-10 in. long and generally simple. *Calyx* superior, 5-fid. *Disk* filling the calyx-tube, 5-lobed. *Petals* 5, inserted below the margin of the disk. *Stamens* 5, enclosed by the petals. *Ovary* 3-celled, sunk in the disk. *Fruit* .5 in. long, 3-winged, 3-celled, 3-seeded, crowned by the remains of the calyx.

Common almost throughout the DŪN: Baroti-wāla, Ambāri, Robbers' Cave, Bindāl nālā, Lāchiwāla, Kālūwāla, Thāno. Khairi, etc., spreading on trees, with a graceful appearance when in flower. Fl. Aug., Sept. Fr. Nov., Dec.

8. *Helinus*, E. Meyer.

1. *H. lanceolatus*, Brandis For. Flora 574, Ind. Trees 175; Gamble Man. Ind. Timb. 189: Fl. Br. Ind. i. 644.

An unarmed twining shrub; branches slender, branchlets angular, usually with a tendril near the end. *Leaves* 1-3 by .5-1 in., lanceolate, very gradually acute, rather membranous, wholly glabrous or slightly canescent beneath; lateral nerves 3-4 pairs, slender; base rounded or sub-cordate, 3-nerved. *Flowers* about .2 in. diam., pale-yellow, umbelled on short lateral branchlets, each umbel subtended by a bract or rudimentary leaf .3-.7 in. long; peduncles .5-1 in. long, slender. *Calyx* superior, cup-shaped. *Disk* filling the calyx-tube. *Petals* 5, hooded, inserted on the margin of the disk. *Stamens* 5, equalling the petals. *Ovary* 3-celled; stigmas recurved. *Fruit* .2-.3 in. diam., broadly turbinate or globose, 3-celled, 3-seeded, tardily dehiscent.

Ravines, banks of streams and shady places in the DŪN, and in the SAHĀRANPUR SIWĀLIKs, also occasionally in valleys in JAUNSR: Tapkeshwar, Lāchiwāla; Shāhjahānpur, Rānipur, etc.

Fl. and fr. almost throughout the year.

XXVII. VITACEÆ. (*Ampelidaceæ*).

Erect or climbing shrubs usually with copious watery juice. *Leaves* alternate, stipulate, simple or compound. *Flowers* regular, cymose, usually 2-sexual.

Calyx entire, or 4-5 toothed or -lobed. *Petals* 4-5, free or cohering at the base or apex, valvate, caducous. *Disk* fleshy. *Stamens* as many as the petals and opposite to them; filaments subulate, sometimes monadelphous. *Ovary* 2-6-celled; style short or none. *Fruit* a berry with 1-6 bony seeds.

Analysis of the Genera.

- | | |
|--------------------------------------|-----------|
| Climbing shrubs. Stamens free; ovary | |
| 2-celled | 1. VITIS. |
| Erect shrubs or herbs. Stamens mona- | |
| delphous; ovary 3-6-celled | 2. LEEA. |

1. *Vitis*, Linn.

Climbing shrubs, sinistorse if twining, usually with leaf-opposed tendrils. *Leaves* simple or 3-9-foliolate. *Flowers* variously cymose, 2-sexual or polygamous. *Calyx* 4-5-lobed. *Petals* 4-5, free or cohering at the apex. *Stamens* free, inserted below the margins of the disk. *Ovary* usually 2-celled, with 2 ovules in each cell; style short or 0. *Fruit* a 1-4-seeded berry.

Planchon in his monograph of the genus in Volume V of De Candolle's *Monographiæ Phanerogamarum* has divided it up into a number of genera and this arrangement has been adopted at Kew and in some modern floras but for practical purposes it is best to keep it intact.

Analysis of the Species.

- | | |
|---------------------------------------|---------------------------|
| <i>Leaves</i> simple. | |
| Flowers tetramerous. | 1. <i>V. repanda</i> . |
| Flowers pentamerous. | |
| Branches and under surface of | |
| leaves densely tomentose | 2. <i>V. lanata</i> . |
| Branches and leaves glabrous, or | |
| the latter slightly pubescent. | |
| Stem soft. Leaves 3-7 in.; petals | |
| distinct | 3. <i>V. latifolia</i> . |
| Stem woody. Leaves 2-3 in.; | |
| petals cohering at the apex | 4. <i>V. parvifolia</i> . |

Leaves 3-foliate.

Flowers 4-merous 5. *V. trifolia*.

Flowers 5-merous.

Inflorescence tendril bearing . . . 6. *V. divaricata*.Inflorescence not tendril bearing . . 7. *V. semicordata*.

Leaves 5-foliate, flowers 4-merous.

Leaves digitately compound 8. *V. obtecta*.

Leaves pedately compound.

Stems slender, wiry 9. *V. capreolata*.Stems thick, woody 10. *V. lanceolaria*.

1. ***V. repanda***, W. & A. ; Fl. Br. Ind. i. 648. Gamble Man. Ind. Timb. 190.

A large climber; branches ribbed, brittle, woolly when young; old stem with wrinkled bark. *Leaves* simple, 3-5 by 2·5-4 in., ovate, cordate, acuminate, crenate with sharp points, rusty-tomentose beneath when young, glabrescent when old; petiole 1-3 in. long; tendril forked. *Flowers* tetramerous, in slender umbel-bearing cymes; peduncle 1-4 in. long. *Petals* cream-coloured, connate at the apex. *Fruit* 3-4 in. long, pyriform, tipped with the persistent style.

The DŪN, and at low elevations in JAUNSAAR and TEHRIGARHWAL; not common. Phāndowāla.

Fl. May, June. Fr. Rainy season.

V. rosca, Royle Ill. t. 26, f. 1 has been included under *V. repanda* W. & A. in Flora of British India. It has been collected in Mohand Pass on the Siwalik range by Royle and may occur elsewhere in similar situations. It is very near *V. repanda* from which it is said to differ in its larger leaves, pink instead of white flowers and fusiform fruit.

2. ***V. lanata***, Roxb. ; Fl. Br. Ind. i. 651 ; Brandis For. Flora 99, Ind. Trees 177 ; Vern. *Bhināna*, Jaunsar.

A large woody climber; branches inflorescence and leaves covered with reddish or brown-felted tomentum. *Leaves* simple, 3-6 in. diam., ovate or suborbicular, cordate, acuminate, dentate, more densely tomentose beneath than above, sometimes obscurely 3-lobed, 3-7 nerved at the base; petiole 1-4 in. long; tendrils simple or forked. *Flowers* pentamerous, greenish, very sweet-scented, in large leaf-opposed compound panicles; peduncle 1-3 in. long, generally with a tendril at the apex. *Petals* 5, pale-green, connate above. *Stamens* long; filaments very slender. *Fruit* about 2 in. diam., globose, usually 1-seeded.

Common throughout the HILLS up to 5,000 ft. : Málköt, Rájpur, Dhárágádh and other valleys, Thadiár, etc.

The stem yields an abundance of watery sap which can be drunk.

Fl. April-June. Fr. July-Sept.

3. **V. latifolia**, Roxb. : Fl. Br. Ind. i. 652 ; Brandis For. Flora 99, Ind. Trees 177 ; Gamble Man. Ind. Timb. 190. Vern. *Pánibel*, Hind.

A large climber ; stem soft, very porous, furrowed and corky outside when old ; branches glabrous. *Leaves* simple, 3-7 by 4-8 in., suborbicular, cordate, 5-angled or 5-lobed, dentate, membranous, tomentose beneath when young, 5-nerved at the base ; lateral nerves 3-7 pairs above the base ; nerves and veins always more or less pubescent beneath ; petiole 2-4 in. long ; tendril slender, forked, one of the forks developing into inflorescence. *Flowers* pentamerous, reddish-brown, in compound pyramidal panicles. *Petals* distinct. *Stigma* sessile. *Berry* 3-4 in diam. black, 2-seeded ; seeds elliptic, rugose on the margins.

Common in the DÚS and SAHÁRANPUR FORESTS, generally climbing on Sál and other tall trees.

The stem yields when cut a large quantity of good potable water, which is a great relief to coolies working in dry waterless forests.

Leaflets Nov.-Mar. Fl. May-July. Fr. Oct.-Dec.

4. **V. parvifolia**, Roxb. ; Fl. Br. Ind. i. 652 ; Brandis For. Flora 99, Ind. Trees 177.

A slender woody climber, wholly glabrous. *Leaves* simple, 2-3 in. by 1-2 in., triangular-ovate, acuminate, dentate or very distantly serrate, sometimes lobed, membranous but tough, quite glabrous ; lateral nerves 3-5 pairs above the cordate and 5-nerved base ; tendrils 2-fid. *Flowers* pentamerous, minute, green, on slender umbellately-clustered pedicels ; clusters arranged on simple or divided erect leaf-opposed racemes ; peduncle 5-7 in. long ; pedicels 2 in. long, filiform, much thickened in fruit. *Petals* cohering at the apex. *Style* distinct, short. *Fruit* about 3 in. diam., 1-seeded, globose, black when ripe.

Fairly common in JAUNSAAR and TEHRI-GARHWAL and the OUTER HIMALAYA, 3-6,000 ft. : Málköt ; below Mussoorie ; Sáíá, Korwá, Dhárágádh ; Thadiár, Bámsu, etc.

Fl. April, May. Fr. June, July.

Closely allied to the last two species is the European Grape Vine, *V. vinifera*, Linn.; Fl. Br. Ind. i. 652. Vern. *Angûr-ki-Bel*, Hind.—which is cultivated to some extent in the Dûn and at Saharanpur, but does not bear good fruit, as the time for it to ripen comes in the rainy season, when there is not sufficient sunshine.

5. *V. trifolia*, Linn.; Syn.—*V. carnosâ*, Wall. Fl. Br. Ind. i. 654; Brandis For. Flora 101, Ind. Trees 178. Vern. *Amal-bel*.

A large climber; *stems* herbaceous, compressed, springing from a stout perennial root-stock, young parts softly pubescent; *tendrils* leaf-opposed, slender, usually branched. *Leaves* 3-foliate; *leaflets* 1.5-3 in. by .9-1.5 in., ovate, elliptic or obovate, acute or obtuse, crenate-serrate or subinciso-dentate, more or less pubescent on both surfaces; *common petiole* .75-2 in. long, *petiolules* of the lateral leaflets 0.25 in. long, those of the terminal leaflets about twice as long. *Flowers* tetramerous, greenish-white, in trichotomous compound cymes; *peduncle* longer than the petioles. *Calyx* cupular, truncate or obscurely 4-lobed. *Petals* 4, distinct, hooded at the tips. *Style* conspicuous, subulate. *Berry* obovoid-globose, black, 2-4-seeded. *Seeds* triangular, rounded and rugose on the back, cuneate on the face.

Common in the Dûn and Saharanpur Forests generally on hedges and other trees.

Fl. July-Sept.

The tuberous root is often applied, in the form of a poultice, to indolent swellings to promote suppuration.

6. *V. divaricata*, Wall.; Fl. Br. Ind. i. 657.

An extensive slender climber, all parts covered with cottony tomentum when young, glabrescent when mature; *stems* hollow. *Leaves* digitately compound; *leaflets* 3, ovate-lanceolate, acuminate, thinly membranous, cuspidate-serrate, or subentire; *lateral leaflets* unequal-sided, often cordate and lobed; *petiole* 2.4-5 in. long; *terminal leaflet* upto 8 in. long by about 3 in. broad, the lateral nearly as long but often broader; *petiolule* of terminal leaflet up to 1 in.; those of the lateral leaflets slightly shorter. *Flowers* pentamerous, reddish-brown, in small, rather dense umbellate cymes 1.5-2 in. diameter; *peduncle* 3-6 in. long, bearing forked tendril about 1 in. from the top. *Petals* 5. *Stamens* 5. *Berry* globose, about .3 in. diameter, 3-4-seeded. *Seeds* .3 in. by .2 in., elliptic, flat, emarginate.

Outer Himalaya, 4,7000 ft. i.e., Mussoorie; Jharipani, etc.

Fl. Aug.-Sept.

7. **V. semicordata**, Wall., var. *Roylei*, King Journ. As. Soc. Beng. lxx. Part ii. p. 113; Brandis Ind. Trees 178; Gamble Man. Ind. Timb. 190; Fl. Br. Ind. i. 665. Syn.—*V. himalayana*. Brandis For. Flora 100. Vern. *Kandár*-(*Báli*), *Pánlu-ki Bál*, Jaunsar.

A large woody climber with stems up to 6 in. diameter, *Leaves* 3-foliolate. *Leaflets* 2-4 by 1.5-2 in., the lateral very obliquely ovate, the terminal rhomboidal or elliptic, acuminate, serrate or dentate, pilose along the nerves beneath or glabrous; lateral nerves about 8 pairs; common petiole 1-3 in.; petiolule 1-2 in.; tendrils 0. *Flowers* pentamerous yellowish-green, in compound trichotomous leaf-opposed cymes. *Style* short, stout. *Fruit* .3-.4 in. diam., 1-4-seeded, black when ripe.

JAUNSAR and TEHRI-GARHWAL, 3-, 9,000 ft.; common.

Wood brown, hard, mottled with a pretty silver-grain, capable of being used for picture-frames. The leaves turn bright orange or red before falling.

Fl. Apr., May. Fr. Aug., Sept.

8. **Vitis obecta**, Wall.; Fl. Br. Ind. i. 657.

A slender climber often rooting at the nodes; branches, petioles and peduncles covered with soft villous red hairs. *Leaves* digitate, mostly 5-foliolate; *leaflets* up to 3 in. long by about 1.5 in. broad, sessile or subsessile, ovate-lanceolate, elliptic or obovate, acute at the base, distantly serrate, membranous, more or less pubescent on both surfaces, especially on the midrib, the lateral usually much smaller than the terminal; *petiole* 1.5-2.5 in. long. *Tendrils* short, branched, very slender. *Inflorescence* umbellate, shortly peduncled. *Flowers* polygamous, 4-merous, .16 long. *Style* 0. *Stigma* 4-lobed. *Fruit* nearly globose, .3 in. diameter, black when ripe, 1-seeded. *Seed* elliptic .25 in. long, convex on the back, furrowed on the face.

Outer Himalaya up to 6,000 ft., i.e., Mussoorie. Common in shady forest and moist ravines.

Fl. May.

9. **V. capreolata**, Don; Fl. Br. Ind. i. 659; Brandis For. Flora 101; Ind. Trees 178.

A slender wiry climber. *Leaves* pedately quinquefoliate. *Leaflets* very variable, .5-4 by .3-1.3 in., obovate to narrow-lanceolate, acute or acuminate, the lateral more or less oblique, cuspidately serrate, membranous, glabrous; *petiole* 1-3 in.; secondary petiolule .1-1.5 in.; ultimate petiolule minute or 0; tendrils slender, smooth, generally forked near the end. *Inflorescence* a compound umbel, or simple umbels cymosely arranged; peduncle 1.5-2 in. long, usually

with several conspicuous bracts; ultimate pedicels about .2 in. long. *Flowers* 4-merous. *Stigma* sessile, flat. *Fruit* about .4 in. long, globose, 2-4-seeded, black when ripe.

Valleys in JAUNSAAR and TEHRI-GARHWAL, and the OUTER HIMALAYA near Mussoorie, 3,-7,000 ft., usually on trees or rocks in shady places. Also at Robber's Cave and elsewhere in the DUN.

Fl. Aug., Sept. Fr. Oct., Nov.

10. *Vitis lanceolaria*, Roxb.; Fl. Br. Ind. i. 660; Brandis For. Flora 101, Ind. Trees 178.

A large climber, glabrous except the inflorescence and the stipules; larger stems woody, flattened; *branches* often covered with corky warts or tubercles. *Tendrils* simple, leaf-opposed, glabrous. *Leaves* pedately 5-foliate, more rarely 3-foliate; *petiole* 1.7-4 in.; *leaflets* 3-5 in. long by 1.2 in. broad, stalked, lanceolate, elliptic or oblanceolate, distantly crenate-serrate, acuminate, more or less fleshy. *Cymes* axillary, pubescent, dichotomously compound, very shortly peduncled, polygamo-dioecious, the female cymes denser. *Flowers* tetramerous, .1 in. long. *Calyx* inconspicuous, *Petals* distinct, ovate-oblong, obtuse. *Stigma* large, 4-lobed. *Berry* ovoid, .4 in. in diameter, 1-3-seeded. *Seeds* smooth, ellipsoid, obtusely angular on the face, rounded and with a single deep groove on the back.

Ravines in the outer Himalaya up to 3,500 ft. Robber's Cave; Rispana ravines above Rajpur trailing over rocky banks.

Fl. April. Fr. Jan.-March.

2. *Leea*, Linn.

Erect shrubs or herbs. *Leaves* usually alternate, simple or 1-3-pinnate, petiole dilated at the base into sheathing stipules. *Flowers* in leaf-opposed compound corymbose cymes. *Calyx* 5-toothed. *Petals* 5, more or less connate at the base and adhering to the staminal tube. *Stamens* 5, united at the base into a tube; free end of filaments short, reflexed. *Ovary* 3-6-celled, inserted on the disk; ovules solitary in each cell; style short.

Analysis of the Species.

- Leaflets acute, glabrous ; flowers red . . . 1. *L. alata*.
 Leaflets abruptly long-acuminate,
 scabrous ; flowers green 2. *L. aspera*.

1. ***L. alata***, Edgew. ; Fl. Br. Ind. i. 665 ; Brandis For. Flora 102, Ind. Trees 179 ; Gamble Man. Ind. Timb. 191 ; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 101.

A large perennial herb. *Leaves* imparipinnate ; petiole grooved, winged. *Leaflets* 5-7, 6-12 by 1-2.5 in., oblong, acute, serrate, glabrous but rough with minute elevated dots, sessile or the lowest pair shortly petioluled ; lateral nerves 8-12 pairs ; base acute or rounded. *Cymes* compact, corymbosely branched, 2-3 in. across ; peduncle 2-6 in. long, furrowed, rough with elevated glandular dots. *Flowers* small, red. *Anthers* united. *Fruit* .3-.4 in. diam., reddish-purple, succulent.

Fairly common in the Dén ; Dehra, Lachiwála, etc.

Fl. June, July. Fr. Sept., Oct.

2. ***L. aspera***, Edgew. ; Fl. Br. Ind. i. 665 ; Brandis For. Flora 102, Ind. Trees 180 ; Gamble Man. Ind. Timb. 191 ; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 136. Vern. *Kawá Okhár* Jaunsar.

A large perennial herb. *Leaves* simply imparipinnate, or the lower often bipinnate. *Leaflets* (or pinnae) 2-3 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, abruptly long-acuminate, obtusely crenate, scabrous ; lateral nerves 12-16 pairs, straight ; base rounded or subcordate ; common petiole not winged, of variable length ; ultimate petiolule slender, .2-7 in. long. *Corymbs* sessile (so as to appear clustered) or shortly peduncled. *Flowers* small, green. *Anthers* not united. *Fruit* .3-.4 in. diam., succulent, black when fully ripe.

Common in ravines in the Dén. Also in JAUN SAR up to 6,000 ft.

The ripe fruit is eaten.

Fl. June, July. Fr. Oct., Nov.

*Order 4.—SAPINDALES.***XXVIII. SAPINDACEÆ.**

Trees or shrubs. *Leaves* various. *Flowers* usually polygamous. *Calyx* 4-5-lobed : lobes more or less

connate. *Petals* 4-5 or 0, imbricate, often hairy at the base within. *Stamens* hypogynous, 5-10, generally 8; filaments often pubescent. *Disk* complete or one-sided. *Ovary* sometimes eccentric, 1-4, generally 3-celled; ovules 1-2 in each cell, ascending; style simple or divided, usually terminal. *Fruit* various. *Seeds* generally exalbuminous, sometimes arillate, usually with a large hilum.

Analysis of the Genera.

Flowers irregular.

(Leaves opposite, exstipulate, digitate;
fruit a leathery capsule) 1. ÆSCULUS.

Flowers regular.

Leaves alternate, exstipulate.

Leaves paripinnate: fruit indehiscent.

Fruit dry: seeds in a fleshy arillus 2. SCHLEICHERA.

Fruit fleshy or coriaceous: seeds not
arillate 3. SAPINDUS.

Leaves simple; fruit a membranous
capsule 5. DODONÆA.

Leaves opposite, exstipulate, palmately
lobed or undivided: fruit a double
samara 4. ACER.

Leaves opposite, stipulate, trifoliate or
pinnate: fruit an inflated membranous
capsule 6. STAPHYLEA.

1. Æsculus, Linn.

1. *Æ. indica*, Colebr.; Fl. Br. Ind. i. 675; Brandis For. Flora 103, t. 19, Ind. Trees 185; Gamble Man. Ind. Timb. 193 The Horse-chestnut tree. Vern. *Pangár, Bankhór, Kándur, Kandár* Jaunsar.

A large tree with scaly buds; the old bark peeling off upwards in long thick bands. *Leaves* opposite, digitate, exstipulate, deciduous; common petiole 4-6 in. long. *Leaflets* 5-9, 6-10 by 2-3-5 in. the centre ones largest, oblanceolate or oblong, acuminate, sharply serrate, glabrous; lateral nerves 15-22 pairs, arcuate; base acute, petiolules 2-1 in. long; bud scales about 1-5 in. long, oblong, membranous, caducous. *Flowers* white, horizontal, in large thyrsoid

cyme-bearing terminal panicles. *Calyx* .2-.3 in. long, tubular, with 5 short rounded lobes, often split longitudinally in open flowers. *Petals* 4, the place of the 5th usually vacant, white and yellow, .6-.8 in. long, clawed, unequal in breadth. *Stamens* 7, filiform, curved upward, longer than the petals; anthers versatile. *Disk* one-sided. *Ovary* sessile 3-celled; style simple, slender. *Fruit* a 1-3-celled capsule, 1—2 in. long, ovoid, rough outside. *Seeds* exalbuminous, about 1.25 in. diam., dark-brown, smooth, shining; hilum about .5 in. diam.

Shady ravines in JAUNSAAR and TEHRI-GARHWAL, 5-, 10,000 ft. Fairly common; abundant about LOKHAR.

Wood of a cream-colour, soft and close-grained; pores small; medullary rays very fine and numerous; weight about 35 lbs. per c. ft. It is turned into cups, dishes and platters which are used to hold milk, ghee, etc., and are in common use in the HILLS. The fruit is given to cattle and goats, and the embryo is eaten by the hill people ground and mixed with flour.

Fl. April-June. Fr. July, Oct.

2. *Schleichera*, Willd.

1. *S. trijuga*, Willd.; Fl. Br. Ind. i. 681; Brandis For. Flora 105, t. 20. Ind. Trees 189; Gamble Man. Ind. Timb. 194. Vern. *Gausam*, *Gosam*, *Kusam*, Hind.

A large umbrageous tree: bark grey, exfoliating in plates of irregular shape, red inside. *Leaves* paripinnate, thin and of a pink colour when very young, coriaceous and dark-green when old; rachis 3-5 in. long. *Leaflets* 2-4 pairs, opposite, 2-9 by 1.5-3.5 in., oblong elliptic ovate or obovate, subsessile, quite entire, glabrescent, the terminal pair much the largest; main lateral nerves 12-20 pairs. *Flowers* yellowish-green, polygamous, fascicled on simple or compound interrupted drooping racemes which are 3-5 in. long and crowded near the ends of the branches; some trees produce only male flowers. *Calyx* cup-shaped, about .1 in. across. *Petals* 0. *Disk* complete, wavy. *Stamens* 5-8, inserted within the disk, much exceeding the calyx. *Ovary* 3-4-celled; ovules solitary in each cell, style simple; stigma 3 4-cleft. *Fruit* .6-.8 in. diam., 1-celled, globose, abruptly tapering to a point, dry, indehiscent. *Seeds* in a pulpy aril having an acid taste.

Somewhat scarce in the DÚN Forests, except at Tháno, Sainkôt, Khairi, etc., but very common along the foot of the SAHÁRANPUR SWALIKS, and in the LOWER HIMALAYA and HIMALAYAN VALLEYS, e.g., Kálsi, Málkôt, etc.

The wood is reddish-brown, very hard, and marked with white wavy concentric lines; weight about 70 lbs. per c. ft. It is used for oil and sugar mills, naves of carts, and such other purposes. The lac produced on this tree is considered to be of the finest quality. The young fruit is pickled and the acid pulp of the ripe fruit is eaten. The seed yields a fat oil which is used for burning. The tree is lopped for fodder.

New leaves and fl. Mar., April. Fr. Aug.-Oct.

3. *Sapindus*, Linn.

1. *S. Mukorossi*, Gaertn.; Fl. Br. Ind. i. 683; Brandis Ind. Trees 191 Syn.—*S. detergens*, Roxb.; Brandis For. Flora 107; Gamble Man. Ind. Timb. 196. The Soap-nut tree. Vern. *Rithá*, Hind.

A handsome tree, somewhat resembling the *Tín*; bark grey. *Leaves* alternate, paripinnate, 12-20 in. long. *Leaflets* 5-10 pairs, opposite or alternate, 3·5-6 by 1·2 in., gradually smaller towards the apex of the rachis, lanceolate, acuminate, entire, coriaceous, glabrous; lateral nerves numerous; petiolule 1·2 in. long. *Inflorescence* a terminal thyrus or a compound cymose panicle. *Flowers* small, regular, polygamous. *Calyx-lobes* somewhat unequal, ciliate. *Petals* white or purplish, alternating with the calyx-lobes, ciliate. *Stamens* 8, inserted in the centre of the disk; filaments white-woolly; anthers versatile. *Ovary* usually 3-celled. *Fruit* a fleshy globose 1-seeded drupe, 1·7-1 in. diam.; seed smooth, black, loose inside when dry; the saponaceous pericarp wrinkled and somewhat translucent in the dry fruit.

Cultivated in the DÚN, as well as in JAUNSA, e.g., near Thádiar, Lokhár, etc.,—possibly, but somewhat doubtfully, indigenous.

Wood light-yellow, moderately hard, compact and close-grained, weighing about 44 lbs. per c. ft. It is not used. The tree is much valued for the fruit, which is a good substitute for washing-soaps, to which it is considered even superior in the case of woollen or silk fabrics. The leaves are given as fodder to cattle.

Fl. May, June. Fr. Oct.-Jan.

4. *Acer*, Tourn.

The Maples.

Trees with scaly buds. *Leaves* opposite, palmately lobed or undivided. *Flowers* regular, usually polyga-

mous. *Calyx* usually 5-parted, deciduous. *Petals* as many as the calyx-lobes, sometimes absent. *Disk* thick annular, glabrous; margin lobed. *Stamens* generally 8, inserted on the disk: filaments usually longer in the male than in the hermaphrodite flowers. *Ovary* 2-lobed, laterally compressed, usually 2-celled; style deeply 2-fid. *Fruit* a double samara with membranous reticulate wings, indehiscent; seeds usually solitary.

Analysis of the Species.

Leaves undivided, margins entire.

Leaves pale glaucous beneath; petiole

·7-1 in. long 1. *A. oblongum*.

Leaves green beneath; petiole 2-5 in.

long 2. *A. kerigatum*.

Leaves 5-lobed, margins serrate.

Leaves pale beneath.

(Serratures large and obtuse) 3. *A. casium*.

Leaves green beneath (sometimes 3-lobed).

Serratures distant, acumen short 4. *A. villosum*.

Serratures close, acumen long 5. *A. acuminatum*.

Leaves 5-7-lobed, margins entire 6. *A. pictum*.

1. ***A. oblongum***, Wall.: Fl. Br. Ind. i. 693; Brandis For. Flora 110, Ind. Trees 181; Gamble Man. Ind. Timb. 199. Vern. *Pāngoi*, *Parāngā*, Jaunsar; *Kirmolā*, *Kirmolī*. Garhwal.

A middle-sized tree; bark grey, smooth, with horizontal wrinkles; stem often irregularly buttressed at the base. *Leaves* 2·5-6 by ·7-2·5 in., oblong or ovate-lanceolate, acuminate, entire, glaucous beneath; lateral nerves 6-8 pairs; base rounded, rarely sub-acute, 3-nerved; petiole ·7-4 in. long, terete, flexuose, coral-red. *Flowers* pentamerous, in terminal or leaf-bearing lateral corymbose panicles; pedicels and calyx hairy. *Sepals* and *petals* ·1 in. long, linear-oblong. *Stamen* 8, exserted, glabrous. *Ovary* hairy. *Fruit* glabrous; nuts more or less angular; wings 1 in. long, contracted at the base, divergent, almost straight at the back.

OUTER HIMALAYA and HIMALAYAN VALLEYS up to 6,500 ft., e.g., Málkôt Hills, Tons Valley, ravines below Mohná, etc. Also in marshy localities in the DŪN such as Nakraunda, Lachiwála Mothronwála, etc.

Wood light reddish-brown, moderately hard, close-grained, weighing about 45 lbs. per c. ft. It is used for agricultural implements and made into drinking cups.

Fl. Feb.-April. Fr. Rainy season.

2. **A. laevigatum**, Wall. ; Fl. Br. Ind. i. 693 ; Brandis For. Flora 110, Ind. Trees 181 ; Gamble Man. Ind. Timb. 200.

A fairly large tree with yellowish or ash-coloured smooth bark ; stem often irregularly buttressed. *Leaves* 2·5-5 by 1-2 in., oblong, acuminate, entire or obscurely sinuate, coriaceous, glabrous, strongly reticulate, green beneath ; main lateral nerves about 6 pairs, the basal pair faint and intramarginal ; base rounded or more or less acute ; petiole 2·5 in. long, channelled. *Flowers* in lax terminal panicles. *Sepals* 5, ovate, smaller than the petals. *Petals* white, about 1 in. long, obovate, clawed. *Stamens* 5-8, exserted, glabrous. *Ovary* hairy. *Fruit* glabrous ; nuts ovoid, not angular ; wings 66-1 in. long, divergent, tinged with red until mature, back straight.

MUSSOORIE, in valleys at 6,7000 ft. : scarce.

Wood white, shining, hard and close-grained, weighing 43 lbs per c. ft. It is used for building in Nepal and for tea-boxes in Assam

Fl. Mar., April. Fr. July, Aug.

3. **A. cæsium**, Wall. ; Fl. Br. Ind. i. 695 ; Brandis For. Flora 111, t. 21, Ind. Trees 183 ; Gamble Man. Ind. Timb. 201. Vern. *Kainju*, *Bara Kainju*, *Kainjal*, Jamsar.

A large handsome deciduous tree ; stem generally rough with knotty excrescences known as burrs ; bark grey, exfoliating in thin, vertical strips. *Bud-scales* 1·5-2 by 3·5 in., reddish, white-pubescent. *Leaves* 3-6 in. diam., rather broader than long, 5-lobed, cordate, serrate, pale beneath, generally bright-red, especially when young ; petiole 3-5 in. long, rather stout, flattened at the base. *Flowers* yellowish, in cymosely branched terminal corymbs, appearing with the leaves. *Petals* small, cream-coloured. *Stamens* short, longer on male trees. *Fruit* glabrate ; nuts gibbous ; wings 1·5-2 in. long, slightly divergent, or in some forms erect and overlapping at the inner edges ; back somewhat curved.

HIMALAYAN FORESTS from 6,10,000 ft., fairly common, generally in open places like grazing grounds.

Wood whitish, close-grained, soft or moderately hard ; weight 40 lbs. per c. ft. It is scarcely used excepting that the burrs are sometimes made into cups.

New leaves and fls. April, May. Fr. July-Oct.

4. **A. villosum**, Wall. ; Fl. Br. Ind. i. 695 ; Brandis For. Flora 111, Ind. Trees 182 ; Gamble Man. Ind. Timb. 201. Vern. *Kainju*, Jaunsar.

A fairly large deciduous tree with thin grey bark which is scarcely rough. *Leaves* 4-6 in. diam., generally as long as broad, 5-lobed or by suppression 3-lobed, cordate, irregularly dentate, deep-green, young with silky hairs beneath ; petiole 2-5·5 in. long, rather stout. *Flowers* 5-merous, in compound lateral racemes, appearing before the leaves ; peduncles and pedicels stout, hairy. *Sepals* about 1 in. long, oblong, ciliate, 3-nerved. *Petals* about as long as the sepals but narrower, also ciliate. *Stamens* 5-8, exserted, glabrous. *Fruit* generally rusty villous ; nuts quadrant-shaped, 3-4 in. long ; wings 2 by 1·8 in., divergent, incurved at the back, membranous at the inner edge.

JAUN SAR and TEHRI-GARHWAL, 7,-9,000 ft. : Deoban, Konáin, Mundáli ; Deotá, etc.

Wood white, moderately hard, close-grained, beautifully mottled ; weight 38 lbs. per c. ft. It is seldom used except for fuel. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. June-Aug.

5. **A. acuminatum**, Wall. ; Syn.— *A. caudatum*, Wall. ; Fl. Br. Ind. i. 695, (ex parte.) Brandis For. Flora 112, Ind. Trees 183 ; Gamble Man. Ind. Timb. 201. Vern. *Kainjli*, *Kanjla*, Jaunsar.

A sparingly branched moderate-sized deciduous tree ; bark dark-grey, on young stems and branches dark-green or greenish-red, quite smooth. *Leaves* 2·5-5 by 2-3·5 in., 5-lobed, the two outer lobes smaller than the rest or absent ; lobes caudate-acuminate, pointedly serrate to within 1·5 in. of the tip of the narrow acumen which is 1·5-2·5 in. long ; petiole 2-4 in. long, flattened and subamplexicaul at the base. *Flowers* in terminal and lateral racemes, appearing shortly after the leaves ; pedicels 1-2 in. long, very slender. *Sepals* 2 in. long, oblong, whitish-green. *Petals* somewhat shorter than the sepals, white, obovate, clawed. *Stamens* generally 4-6, exserted. *Fruit* glabrous ; nuts irregularly grooved or pitted ; wings about 1 in. long, erect or divergent, membranous except at the outer edge, undulate at the inner edge.

JAUN SAR and TEHRI-GARHWAL, 8,-11,000 ft. : Deoban, Konáin ; Deotá, etc. ; generally affecting open ravines on shady aspects.

Wood whitish, compact and moderately hard, seldom used ; weight 43 lbs. per c. ft.

Fl. Mar., April. Fr. July-Sept.

6. **A. pictum**, Thunb. ; Fl. Br. Ind. i. 696 ; Brandis For. Flora 112, Ind. Trees 183 ; Gamble Man. Ind. Timb. 202. Vern. *Kainchli*, *Kabasi*, *Dudh*, *Kainju*, Jaunsar.

A moderate-sized handsome tree with thin grey bark. *Leaves* 2.5 by 2.5-7 in., broader than long, 5-7-lobed, rather membranous, glabrous, turning red before falling ; margins quite entire ; base usually deeply cordate, rarely truncate ; petiole 1-6 in. long, slender, flexuous. *Flowers* glabrous, on slender pedicels arranged in terminal or lateral corymbs. *Sepals* about .1 in. long, oblong. *Petals* as long as the sepals, spathulate. *Stamens* 8, shorter than the petals. *Fruit* glabrous ; nuts thin ; wings 1-1.3 in. long, very divergent, with the back sigmoidly curved.

JAUNSAR and TEHRI-GARHWAL, 5.-9,000 ft., the most common of all high-level maples.

Wood white, moderately hard and close-grained, used for ploughs, bedsteads, etc. Tibetan drinking-cups are made of the knotty excrescences (burrs).

Fl. April, May. Fr. June, July.

5. **Dodonæa**, Linn.

1. **D. viscosa**, Linn. ; Fl. Br. Ind. i. 697 ; Brandis For. Flora, 113, Ind. Trees 186 ; Gamble Man. Ind. Timb. 202. Vern. *Sonátta*, *Wuláyti Mchndi*, Hind.

An evergreen shrub with glabrous red branchlets. *Leaves* alternate, simple, exstipulate, subsessile, 1.5-3 by .2-1 in., oblanceolate to linear-cuneate, coriaceous, glabrous, shining above more or less viscid with a yellow resin (whence the specific name) ; lateral nerves numerous, not very prominent. *Inflorescence* a short terminal panicle with racemose branches. *Flowers* polygamous, about .2 in. across. *Sepals* usually 5, about .1 in. long, oblong, greenish-yellow. *Petals* 0. *Stamens* generally 8 ; filaments short ; anther-cells comparatively large. *Disk* obsolete in the male flowers, small in the female. *Ovary* 3-4-celled, with 2 ovules in each cell ; style 3-4-cleft at the apex. *Fruit* a compressed capsule, septicidally 2-4-valved, each valve with an oblong membranous wing which is about .5 by .3 in.

LOWER HIMALAYA, about 4,500 ft. Cultivated in the DÚN and SAHÁRANPUR DISTRICTS in hedges round gardens and railway-platforms.

Wood hard, compact and close-grained, capable of being used for engraving. The branches are used to support the earth of flat

roofs. "The shrub grows readily from seed without much water in arid places"—*Sir D. Brandis*; and "is likely to be important in reclothing denuded tracts."—*Mr. J. S. Gamble*. It makes an excellent hedge.

Fl. Aug.-Feb. Fr. Jan.-June.

6. *Staphylea*, Linn.

1. *S. emodi*, Wall.; Fl. Br. Ind. i. 698; Brandis For. Flora 114, Ind. Trees 181; Gamble Man. Ind. Timb. 203. Vern. *Chitrā*, *Mārchhob*, Jaunsar; *Nagdawn*, Hind.

A large shrub; bark with grey and dark-brown reticulate streaks. *Leaves* 3-foliolate; stipules linear, about 1 in. long. *Leaflets* 3-6 by 1.5-3 in., ovate or elliptic, acuminate, closely serrate, membranous, white-pubescent beneath when young, the lateral very shortly petioluled or sessile, often somewhat oblique; main lateral nerves 6-8 pairs; common petiole 3-6 m., petiolule of the terminal leaflet 5-2 in. long; stipules and stipels caducous. *Flowers* 2-sexual, regular, 5-merous, .75 in. long, in dense pendulous cymes. *Sepals* and *petals* similar, white, erect. *Disk* 5-lobed. *Stamens* 5, inserted between the lobes of the disk. *Ovary* 2-3-celled; styles 2-3, more or less connate. *Fruit* an inflated membranous capsule, 2-3 in. long, 3-lobed, 3-celled; cells tapering to a tail and dehiscing from the apex.

Shady ravines in the HIMALAYA, 5,000 to 9,000 ft.: Jhālkūri Mundāl, Kathiān, Deotā, Lambātach, etc.

Wood white, soft, weighing about 44 lbs. per c. ft. Walking-sticks are made of the long straight branches with the bark unstripped, which, if cut on a Sunday and not shod with iron, are believed to have the property of keeping off snakes.

Fl. April, May. Fr. July, Aug.

To this Family belongs the *Lichi*. *Nepheium Litchi*, Camb.; Fl. Br. Ind. i. 687; which is commonly cultivated in the Dŭx and yields an excellent fruit, the edible part being the fleshy aril. Vern. *Lichī*, Hind.

XXIX. SABIACEÆ.

Climbing or erect shrubs, or trees. *Leaves* alternate, exstipulate, usually simple. *Flowers* small, 1-2-sexual,

generally in panicles. *Calyx* 4-5-cleft; lobes imbricate. *Petals* 4-5, imbricate, sometimes unequal. *Stamens* 4-5, inserted below the ovary and opposite to the petals. *Disk* small, annular. *Ovary* 2-3-celled, compressed or lobed; ovules 1-2 in each cell; styles 2-3, free or connate. *Fruit* a drupe or of 1 or 2 dry carpels; seeds with a broad hilum.

Analysis of the Genera.

Climbers. Petals and stamens equal, the	
latter all fertile	1. SABIA.
Trees. Petals and stamens unequal, only	
2 stamens fertile	2. MELIOSMA.

1. **Sabia**, Colebr.

Scandent shrubs. *Leaves* simple, entire. *Flowers* usually 2-sexual, solitary or in cymes or panicles, each subtended by a pair of opposite bracts. *Calyx-lobes* and *petals* 4-5, equal. *Stamens* 4-5, all fertile. *Disk* 4-5-lobed. *Ovary* 2-lobed; styles 2, more or less cohering. *Fruit* of 1 or 2 dry carpels.

Analysis of the Species.

Flowers large, solitary or fascicled	1. <i>S. campanulata</i> .
Flowers small, in large panicles	2. <i>S. paniculata</i> .

1. **S. campanulata**, Wall.: Fl. Br. Ind. ii. 1; Brandis For. Flora 116, Ind. Trees 193; Gamble Man. Ind. Timb. 204.

A climber with woody branches. *Leaves* 1-3·5 by 4-1·3 in., oblong-lanceolate, acuminate, membranous, soft, puberulous, pale beneath; nerve reticulate; petiole 2-6 in. long, channelled, ciliate. *Flowers* 5 in. across, green or pale-yellow with a dash of purple, usually solitary in the axils of the leaves; peduncle 1-2 in. long.

Sepals minute. *Petals* .2-.3 in. long, orbicular, enlarging in fruit. *Stamens* included. *Fruit* .3-.4 in. diam., of two distinct turquoise-blue compressed reniform carpels; seeds rugose.

JAUN SAR and TEHRI-GARHWAL, 5, -10,000 ft. in shady places; common, though not prevalent.

Fl. April, May. Fr. Rainy season.

2. ***S. paniculata***, Edgew.; Fl. Br. Ind. ii. 3; Brandis For. Flora 117, Ind. Trees 194; Gamble Man. Ind. Timb. 204.

A large climber with a dark-grey stem. *Leaves* 3-8 by 1.3-3 in., oblong-lanceolate, acuminate, tough, coriaceous, dark-green and shining above, pale and strongly reticulate beneath; main lateral nerves 6-8 pairs; base rounded; petiole .4-.7 in. long. *Flowers* yellowish, .15-.2 in. across, in large lateral often leaf-bearing panicles; pedicels hairy. *Drupe* .3 in. diam., orbicular, compressed.

Shady swampy places in the DÚN such as Mothronwála, Gularghāti, Káluwála, Nakraunda, etc.

Fl. Feb., Mar. Fr. June-Aug.

2. *Meliosma*, Bl.

Trees or erect shrubs usually with hairy extremities. *Leaves* simple, rarely pinnate. *Flowers* minute, in large thyrsoid panicles. *Sepals* and *petals* 4-5, unequal. *Stamens* generally 5, two fertile and adnate to the smaller petals, the rest without anthers. *Disk* 4-5-toothed. *Ovary* sessile, usually 2-celled. *Fruit* a drupe, obliquely globose, with a hard kernel; seed solitary.

Analysis of the Species.

- | | |
|---|------------------------------|
| Leaves soft, lateral nerves close and straight; flowers pedicellate . . . | 1. <i>M. dilleniæfolia</i> . |
| Leaves hard, lateral nerves distant and arcuate; flowers sessile . . . | 2. <i>M. pungens</i> . |

1. ***M. dilleniæfolia***, Bl.; Fl. Br. Ind. ii. 4; Brandis For. Flora 115; Ind. Trees 195; Gamble Man. Ind. Timb. 205. Vern. *Goi*, Jaunsar.

A small deciduous tree; young parts covered with rusty pubescence; bark ashy-grey. *Leaves* 4-12 by 2-5 in., obovate or elliptic, abruptly acuminate, cuspidate-serrate, membranous, rough with minute raised dots above, rusty-pubescent beneath; lateral nerves 15-20 pairs, straight and parallel; base acute; petiole .5-1 in. long. *Flowers* 2-sexual, bracteate, in large lax terminal panicles, which extend downward with branches at the axils of the upper leaves. *Sepals* 5, ciliate, the two outer smaller. *Petals* 5, orbicular, white, the two attached to the stamens smaller. *Drupe* .1 in. diam., globose, black when ripe.

JAUN SAR and TEHRI-GARHWAL, up to 10,000 ft., in shady ravines; common in the Bájámára and Konáin Blocks.

Wood dull-white, soft, coarse-grained, used only for fuel.

Fl. May-July. Fr. Aug.-Oct.

2. **M. pungens**, Walp.; Fl. Br. Ind. ii. 4; Brandis For. Flora 116, Ind. Trees 194; Gamble Man. Ind. Timb. 205. Vern. *Búshkuá*, *Bushá*, Jaunsar; *Kharás*, Garhwal.

A small tree with grey bark; young parts covered with rusty pubescence. *Leaves* 5-10 by 1-3 in., oblanceolate, abruptly long acuminate, very distantly cuspidate-serrate, hard, coriaceous, pubescent beneath along the midrib and nerves; lateral nerves 8-10 pairs arcuate, prominent beneath; base very gradually narrowed; petiole .2-.7 in. long. *Flowers* small, sessile, in large compact panicles, supported by 1 or 2 bracteoles which resemble the sepals. *Sepals* round, ciliate. *Petals* membranous, whitish, three large and entire supporting as many staminodes, and two smaller and 5-lobed supporting 2 fertile stamens. *Drupe* .3 in. diam., globose.

JAUN SAR and TEHRI-GARHWAL, 4-8,000 ft., generally in ravines and along streams; Lokhár, the Amláwa and Tons valleys, etc.

Wood soft, of no special value.

Fl. May, June. Fr. July, Aug.

XXX. ANACARDIACEÆ.

Trees or shrubs, generally with milky or resinous juice. *Leaves* usually alternate, simple trifoliolate or pinnate, exstipulate. *Inflorescence* generally a terminal

panicle, less frequently lateral or axillary. *Flowers* small, mostly regular, unisexual or bisexual. *Calyx* 3-5-cleft. *Petals* free, as many as the calyx-divisions and alternating with them, sometimes absent. *Disk* usually annular. *Stamens* generally as many or twice as many as the petals, inserted under (rarely on) the disk, sometimes not all perfect. *Ovary* superior or half-inferior, usually 1-celled and 1-seeded. *Fruit* a drupe. *Seed* exalbuminous.

Analysis of the Genera.

Fruit 1-celled, 1-seeded.

Pericarp dry.

(Leaves simple or compound, petals

4-6) 1. *RHUS*.

Pericarp more or less fleshy.

Leaves simple.

Receptacle of fruit enlarged and fleshy

6. *SEMECARPUS*.

Receptacle of fruit not enlarged or fleshy.

Stamens 1-5, generally only 1 perfect

3. *MANGIFERA*.

Stamens 8-10, all perfect

4. *BUCHANANIA*.

Leaves pinnate.

Petals none

2. *PISTACIA*.

Petals 4-5

5. *LANEAE*.

Fruit 2-5-celled, 2-5-seeded; pericarp fleshy; leaves imparipinnate

7. *SPONDIAS*.

1. *Rhus*, Linn.

Trees or shrubs with a resinous or acrid juice. *Leaves* 3-foliolate or pinnate, rarely simple. *Flowers* small, polygamous, paniced. *Calyx-limbs* 4-6. *Petals* 4-6, imbricate. *Disk* fleshy, annular. *Stamens* 4-10, inserted at the base of the disk. *Ovary* sessile, 1-celled; styles 3. *Drupe* dry, with a pendulous seed.

Analysis of the Species.

- Leaves simple : : : : 1. *R. Cotinus*.
 Leaves 3-foliolate : : : : 2. *R. parviflora*.
 Leaves imparipinnate.
 Petiole winged; (leaflets sessile) . . . 3. *R. semi-alata*.
 Petiole not winged.
 Leaflets sessile; inflorescence terminal 4. *R. punjabensis*.
 Leaflets short-petiolulate; inflor. axillary.
 Innovations densely tomentose . . . 5. *R. Wallichii*.
 Wholly glabrous 6. *R. succedanea*.

1. ***R. Cotinus***, Linn.; Fl. Br. Ind. ii. 9; Brandis For. Flor. 118. Ind. Trees 196; Gamble Man. Ind. Timb. 207. The Wig tree. Vern. *Tūng*, *Tūngoi*, Jaunsar; *Tūnglá*, Garhwal.

A shrub or small tree with thin reddish-brown bark; branchlets red; young parts grey-tomentose. *Leaves* simple, 2-4 by 1·5-3 in., ovate elliptic obovate or orbicular, entire, usually tomentose beneath, less frequently so above; main lateral nerves 10-15 pairs; base more or less acute; petiole 1·5-3 in. long. *Flowers* about 15 in. diam., on very slender pedicels which are arranged in lax terminal panicles, pedicels of sterile flowers elongated and feathery. *Sepals* ovate-oblong. *Petals* elliptic, pale-yellow, much exceeding the sepals. *Filaments* short; anthers comparatively large. *Disk* broad, 4-angled. *Drupe* 2 in. long, compressed, oblique, reddish, covered with white hairs.

Common in JAUNSAR, TEHRI-GARHWAL and OUTER HIMALAYAN slopes, 3,600 ft., generally in open sunny places.

Heartwood of a dark yellow colour and mottled, weighing 56 lbs. to the c. ft. It makes very pretty picture-frames and might be used for cabinet-work. The twigs are used for basket-making, and the bark and leaves for tanning. The leaves and flowers emit the characteristic resinous odour of mango when bruised.

New leaves and fls. April, May. Fr. Autumn.

2. ***R. parviflora*** Roxb.; Fl. Br. Ind. ii. 9; Brandis For. Flora 119, Ind. Trees 196; Gamble Man. Ind. Timb. 208. Vern. *Ninás*, *Ninawa*, Jaunsar; *Tūnglá*, Hind.

A shrub; young parts densely covered with rusty tomentum; bark grey, smooth. *Leaves* 3-foliolate; common petiole 1-2 in. *Leaflets* 1-3 by 1·6-2 in., the terminal much larger than the other two, obovate, crenate, sparsely hairy above, pubescent beneath; the terminal leaflet often narrowed into a marginate petiolule, the others sessile; lateral nerves 8-12 pairs, straight, prominent. *In-*

florescence a terminal panicle with racemose branchlets, some of which rise from the axils of the upper leaves. *Flowers* .1 in. across. *Sepals* ovate. *Petals* oblong, longer than the sepals. *Drupe* .2 in. diam., ovoid, glabrous, brown, shining.

JAUNSAR, TEHRI-GARHWAL and the OUTER HIMALAYA, 2,-5,000 ft. : Dhārāgādh, Tons (Tiuni, Morā Depôt, etc.) and Jumna Valleys : Mālkôt, etc.

Wood hard and close-grained. The fruit is eaten, and is used in Hindu medicine.

Fl. May, June. Fr. July, Aug.

3. *R. semi-alata* Murray : Fl. Br. Ind. ii. 10 : Brandis For. Flora 119, Ind. Trees 197 : Gamble Man. Ind. Timb. 208. Vern. *Tibri*, *Arkhoi*, Jaunsar.

A small deciduous tree ; young parts covered with dark-grey pubescence. *Leaves* imparipinnate, over a foot long turning red before falling ; common petiole usually winged. *Leaflets* 4-6 pairs, opposite, sessile, 2-4 by 1-2 in., elliptic, acuminate, deeply crenate or dentate, glabrous above, soft-tomentose beneath ; lateral nerves 10-15 pairs, parallel ; base rounded, somewhat oblique. *Panicles* terminal, 6-8 in. long, conical, dense-flowered. *Flowers* .1 in. diam., pale-green. *Sepals* ovate. *Petals* oblong, ciliate, much exceeding the sepals. *Drupe* .2 in. diam., subglobose, compressed.

JAUNSAR and TEHRI-GARHWAL. 3.-7,000 ft. : Dhārāgādh and Tons Valleys.

Wood soft, shining, white but with darker streaks, weighing about 27 lbs. per c. ft., not used. The fruit is often eaten by the hill people, and is used medicinally.

New leaves and fls. April, May. Fr. Aug.-Oct.

4. *R. punjabensis*, Stewart : Fl. Br. Ind. ii. 10 : Brandis For. Flora 120, Ind. Trees 197 : Gamble Man. Ind. Timb. 209. Vern. *Titri*, *Titroi*, Jaunsar.

A small deciduous tree with rough dark-grey bark and aromatic leaves ; young parts covered with short pubescence. *Leaves* imparipinnate, over a foot long ; petiole and rachis slender, not winged. *Leaflets* 5-6 pairs, opposite or subopposite, sessile, 3-6 by 1-2.5 in., ovate-oblong or lanceolate, acuminate, entire or serrate near the apex, membranous, pubescent beneath, with scattered hairs above ; lateral nerves about 20 pairs, very slender ; base rounded. *Panicles* terminal, compact, much shorter than the leaves. *Flowers* less than .1 in. diam., yellowish-green. *Drupe* about .2 in. diam., on short pedicels, compressed, covered with a dense purplish tomentum.

JAUNSAK and TEHRI-GARHWAL, 3,-8,500 ft., towards the interior; e.g., Lohár, Kathián; Deotá, etc.

Fl. April, May. Fr. Aug., Sept.

5. **R. Wallichii**, Hook, f. : Fl. Br. Ind. ii. 11; Gamble Man. Ind. Timb. 209; Brandis Ind. Trees 198. Syn.—*R. vernicifera*, DC. (in part); Brandis For. Flora 120. Vern. *Árkhoi*, *Árchoi*, Jaunsar.

A small deciduous tree somewhat resembling the walnut, with smooth grey bark which exudes a black acrid varnish; young parts covered with rusty-brown or ash-coloured tomentum. *Leaves* imparipinnate, approximate near the ends of the branches; common petiole terete, stout. *Leaflets* 3-5 pairs, opposite, sessile, 4-6 by 2-3-5 in., oblong-elliptic, acuminate, entire, grey-tomentose beneath, more or less pubescent above; lateral nerves 20-25 pairs; base rounded, oblique. *Panicles* short, compact, from the axils of the lower or last year's leaves. *Flowers* sessile, .1 in. diam. *Sepals* obtuse. *Petals* much larger than the sepals, obovate, greenish-white, with dark veins. *Drupe* .3 in. diam., much crowded together; pericarp dry, splitting irregularly to form a stellate receptacle for the kernel which is long-persistent and covered with a vegetable wax.

JAUNSAK and TEHRI-GARHWAL, 4,-7,000 ft.; Binalgádh, Dhárágádh, Kathián, Tons Valley, etc.

Sapwood white, soft; heartwood reddish-brown. It is used for saw-frames and axe-handles. The juice of the leaves is corrosive, "In Jaunsar Bawar it is rubbed on thread to strengthen it"—(*Sir D. Brandis*)—but the Jaunsaris have a superstition against the tree which is said to be inhabited by an evil spirit, and consequently they most scrupulously avoid touching it or even going near it.

Fl. May, June. Fr. July-Sept.

6. **R. succedanea**, Linn. : Fl. Br. Ind. ii. 13; Brandis For. Flora 121, Ind. Trees 199; Gamble Man. Ind. Timb. 210. Vern. *Árkhol*, U. P.

A middle-sized deciduous tree with dark-grey thin bark, somewhat resembling the *Tán*. *Leaves* imparipinnate, approximate near the ends of the branches. *Leaflets* 3-6 pairs, opposite, 3-6 by 1-5-3 in., ovate-lanceolate, long-acuminate, entire, thinly coriaceous, usually quite glabrous; lateral nerves 8-15 pairs, alternating with shorter intermediate ones; base rounded acute or oblique; petioles slender, .2-.4 in. long. *Panicles* axillary, with slender and drooping ramifications, much shorter than the leaves. *Flowers* pedicelled, scarcely .1 in. diam., greenish-yellow. *Sepals* ovate, obtuse. *Petals* much larger, oblong or obtuse. *Disk* 5-lobed. *Drupe* .25 in. diam., compressed, glabrous, rugose, yellow or light-brown; pericarp

thin, bursting irregularly; mesocarp fibrous; kernel compressed, hard, surrounded by a vegetable wax.

TEHRI-GARHWAL, 4,-7,000 ft.; Lambatāch. Pájdihár; above Naintwār, Kulhi; Kathian, etc.

Sapwood white, turning brown, soft; heartwood scanty, yellow; not much used. The juice is acid, but the snow-white wax is much appreciated in Japan where the tree is planted along road sides for its sake. The wax is made into candles. Lacquer varnish is also obtained by tapping the bark. The acid pulp of the fruit is eaten in Sikkin and Nepal.

Fl. May-Aug. Fr. Aug.-Oct.

2. *Pistacia*, Linn.

1. *P. integerrima*, Stewart; Fl. Br. Ind. ii. 13; Brandis For. Flora 122, Ind. Trees 199; Gamble Man. Ind. Timb. 210. Vern. *Kakkar*, *Kākroi*, Jaunsar.

A middle-sized deciduous tree with rough grey bark. *Leaves* alternate, pari- or imparipinnate, 6-9 in. long. *Leaflets* 4-6 pairs, subopposite, minutely petioluled, 3-6 by 1-1.7 in., lanceolate, long-acuminate, entire, hard, coriaceous, glabrous; main lateral nerves about 120 pairs, slender; base oblique. *Inflorescence* a lateral panicle. *Flowers* small, apetalous, dioecious. MALE FLS.: *panicles* 2-4 in. long, compact, pubescent; *calyx* gamosepalous, 3-5-lobed; *stamens* 5-7 on a small disk; *anthers* large, red. FEM. FLS.: *panicles* 6-10 in. long, lax, thyrsoid; *sepals* 4, free, linear, deciduous; *ovary* sessile, 1-celled; *styles* 3, cohering only near the base. *Drupe* .25 in. diam., oblique, broader than long, glabrous, rugose.

JAUNSAAR and TEHRI-GARHWAL, also the MÁLKÔT HILLS, 3,-6,000 ft. Āmlāwa nālā, Binālgādh, Tons Valley, etc.

Sapwood white; heartwood mottled with yellow and green streaks, very hard and durable, valued as an ornamental timber; weight 54 lbs. per c. ft. The leaves are lopped for fodder for buffaloes and camels, and the galls (*Kākrasings*) are used in native medicine. The latter are in the shape of a horn, attaining 3-6 in. in length, and are dull-red in colour. They are produced by a Hemipterous insect.

New leaves and fls. Mar.-May. Fr. June-Oct.

3. *Mangifera*, Linn.

1. *M. indica*, Linn.; Fl. Br. Ind. ii. 13; Brandis For. Flora 125, Ind. Trees 206; Gamble Man. Ind. Timb. 211. The Mango tree. Vern. *Ām*. Hind. *Āmbi*, *Dūn* and *Sahāranpur* (vulgar).

A large evergreen tree with rough thick dark-grey bark. *Leaves* alternate, simple, crowded at the ends of the branches, 6-12 by 1.5-4 in., oblong or obovate-lanceolate, entire, coriaceous, dark-green, glabrous; margins often wavy; lateral nerves numerous, arcuate; base acute; petiole 1-2.5 in. long, swollen at the base. *Inflorescence* a terminal panicle about 1 ft. long; bracts elliptic, concave. *Flowers* about .15 in. across, yellowish-green, scented, male and 2-sexual on the same panicle. *Calyx* 4-5-partite; segments imbricate, ovate, concave, deciduous. *Petals* 4-5, imbricate, much longer than the calyx-segments, ovate, yellow, with 3-5 longitudinal ridges. *Disk* fleshy. *Stamens* 4-5, inserted on the disk, only one perfect and longer than the rest; filaments subulate. *Ovary* sessile, obliquely ovoid, glabrous; ovule solitary; style lateral. *Drupe* 2-6 in. long, ovoid, laterally compressed, with a protuberance on one side near the tip indicating the position of the style; putamen fibrous.

Cultivated and almost wild in SAHĀRANPŪR and the DŪN. Several varieties are recognized under cultivation which differ chiefly in the quality of the fruit.

No distinct heartwood and sapwood. Wood grey, coarse-grained, soft, liable to attacks of insects; weight 41 lbs. per c. ft. It is made into planks, and is used for tea-boxes in the Dūn. Doors and windows and sometimes cheap furniture are made of it. The tree is, however, valued chiefly for its fruit. The green fruit is pickled, and is dried in slices as an article of trade in Bengal and elsewhere. The pulp of the ripe fruit is dried in thin plates, which can then be kept for months without losing flavour. Throughout the United Provinces the kernel of the fruit is dried and pounded into a meal, which is used by the poorer classes during famine as a substitute for wheat-flour.

Fl. Mar., April. Fr. June, July.

4. *Buchanania*, Roxb.

1. *B. latifolia*, Roxb.; Fl. Br. Ind. ii. 23; Brandis For. Flora 127, Ind. Trees 205; Gamble Man. Ind. Timb. 216. Vern. *Piyāl* or *Piāl*, Hind.; *Kath Bhilāwa*, Dūn.

A moderate-sized tree, almost evergreen; bark dark-grey or black, furrowed into thick small quadrangular plates, reddish inside. *Leaves* alternate, simple, 6-10 by 2.3-5 in., oblong or elliptic, entire, obtuse at both ends, coriaceous, hard, generally pubescent beneath, closely reticulate; lateral nerves 15-20 pairs, stout, nearly straight; petiole 2-6 in. long, pubescent. *Flowers* 2-sexual, sessile, .15-.2 in. diam., greenish-white, in terminal and axillary pyramidal

panicles. *Calyx* 5-toothed, persistent. *Petals* 5, oblong. *Disk* fleshy, 5-lobed. *Stamens* 10, as long as the petals. *Carpels* 5, hairy, inserted at the base of the disk, 1 perfect, 4 reduced to thread-like processes. *Drupe* 5 in. long, ovoid-oblong, black when ripe; stone hard, 2-valved; seeds oily.

Common in the Sál forests of the SIWALIK DIVISION, where the soil is at all clayey. Scarce in the E. DÚN beyond the Sóng river.

Wood greyish-brown, moderately hard, with a small dark-coloured heartwood, fairly durable if kept dry and free from white-ants. Weight 33 lbs. per c. ft. It seasons well, and is used for boxes, bedsteads, yokes, doors, furniture, and the like. The poles are made into *tōrs* in the Saharanpur Division, which are used to support light roofs. The bark is used for tanning. The ripe fruit has a pleasant sweetish-acid flavour, and the kernel, which resembles the pistachio-nuts, is an important article of trade in the Central Provinces, where it is called *chironji*. The leaves are sometimes used as a substitute for plates.

Fl. Feb., Mar. Fr. May, June.

5. *Lannea*, A. Rich. (*Odina*, Roxb.).

1. *L. grandis*, Engl.; Syn.—*Odina* Wodier, Roxb.; Fl. Br. Ind. ii 29; Brandis For. Flora 123, Ind. Trees 200; Gamble Man. Ind. Timb. 218. Vern. *Jhinghan*, Hind.; *Jinghiní*, Sans.

A moderate-sized deciduous tree with thick soft branchlets; bark grey, smooth up to middle age, afterwards exfoliating in thin round plates, red inside. *Leaves* alternate, few at the ends of the branches, imparipinnate, 12-18 in. long, turning yellow before falling. *Leaflets* 7-11, shortly petiolulate, 3-6 by 2-3.5 in., ovate, long-acuminate, quite entire, rather membranous, glabrous when old; lateral nerves 4-6 pairs, arcuate; base rounded. *Flowers* 1-sexual, 4-merous, 1-1.5 in. diam., fascicled on simple and compound racemes which are crowded at the extremities of the still leafless branches; male and female usually on different branches. *Bracts* numerous, ciliate. *Calyx* 4-lobed, persistent; lobes obtuse, ciliate, about .05 in. long. *Petals* longer than the sepals, oblong, spreading, greenish-yellow. *Disk* annular, 4-lobed. **MALE** FLS.: *racemes* paniced; *stamens* twice as many but as long as the petals, inserted within the disk; *anthers* versatile. **FEM.** FLS.: *racemes* simple; *disk* surrounded by sterile *stamens*; *ovary* sessile, 1-celled, with 3-4 distinct *styles*. *Drupe* .6 in. long, oblong, compressed.

Extremely common in the DÚN and SAHÁRANPUR FORESTS. Also found at low elevations in the HILLS, e.g., near Thadiár.

Sapwood white and soft ; heartwood scanty, red when fresh-cut, afterwards reddish-brown, moderately hard and close-grained but not durable ; weight 50-60 lbs. per c. ft. A useful gum exudes from wounds made in the wood, for which the tree is tapped in April and May on a regular rotation in the Sahāranpur Division. The leaves are greedily eaten by cattle, and elephants are fond of the young shoots. The tree can be most easily propagated by cuttings.

Fl. Mar., April. Fr. June, July.

6. *Semecarpus*, Linn. fil.

1. *S. Anacardium*, Linn. fil. ; Fl. Br. Ind. ii. 30 ; Brandis For. Flora 124 ; Gamble Man. Ind. Timb. 220. The Marking-nut tree. Vern. *Bhilāra*, Hind.

A moderate-sized deciduous tree with rough dark-brown bark which yields an acrid juice ; young parts, leaves beneath, and inflorescence pale-tomentose. *Leaves* crowded at the extremities of the branches, alternate, simple, 9-24 by 5-14 in., obovate-oblong, often pandurate, entire, rather coriaceous, more or less hispidly pubescent, pale beneath ; tip and also the base rounded, or the latter sometimes cordate ; lateral nerves 16-24 pairs, stout, slightly arched. *Flowers* polygamous or diœcious, .2-.3 in. diam., in fascicles on large terminal panicles ; bracts lanceolate. *Calyx* 5-cleft ; segments deciduous. *Petals* 5, oblong, glabrous, greenish-yellow, much longer than the sepals. *Disk* broad, annular. *Filaments* subulate. *Styles* 3. *Drupe* 1 in. long, the shape of a mango, compressed, shining, black when ripe, seated on an orange-coloured fleshy receptacle formed of the disk, the base of the calyx and the extremity of the peduncle.

Fairly common in the Sāl forests within the area generally on clayey soil and in the moister localities.

Sapwood and heartwood not distinct. The wood is soft and light, weighing about 35 lbs. per c. ft. ; not used. The cup of the ripe fruit is eaten raw, dried or roasted. The pericarp contains an acrid juice which is used as marking-ink and in medicine.

Leafless Feb.-April. New leaves May. Fl. May, June. Fr. Nov.-Feb.

7. *Spondias*, Linn.

1. *S. mangifera*, Willd. ; Fl. Br. Ind. ii. 42 ; Brandis For. Flora 128, Ind. Trees 261 ; Gamble Man. Ind. Timb. 223. The Hog-plum tree. Vern. *Ambāra*, Hind.

A deciduous tree with smooth grey bark, every part of which has a characteristic aromatic smell. *Leaves* alternate, imparipinnate, 12-18 in. long. *Leaflets* 9-11, opposite, short-petiolulate, 3-9 by 1-5-4 in., oblong-elliptic, acuminate, entire, soft, rather membranous, quite glabrous, turning bright-yellow before falling; lateral nerves 10-30 pairs, straight, parallel, nearly transverse, joined by a strong intramarginal nerve. *Flowers* 2 in. diam., polygamous, nearly sessile, in spreading terminal panicles. *Calyx* 5-toothed, deciduous. *Petals* 5, about 1 in. long, oblong, greenish-white, spreading. *Disk* cupular, crenate. *Stamens* 10, inserted below the disk; filaments subulate, shorter than the petals; anthers versatile. *Ovary* sessile, free; carpels 4-5, distinct in flower, coalescing into a single stone in fruit; ovules solitary, pendulous; styles as many as the carpels. *Drupe* 1-5-2 in. long, ovoid or oblong, fleshy, smooth, yellow when ripe; putamen fibrous and pitted with cavities outside, with 2-5 seeds, of which, however, usually only one is perfect.

Fairly common in the DÚN and SAHÁRANPUR FORESTS. Also found in the Tons Valley, JALNSAR and TEHRI-GARHWAL.

Wood soft, light grey, with large pores, weighing about 26 lbs. per c. ft.; useless even as fuel. The tree is often attacked by insects, and the holes made by them exude a gum which is insoluble in water. The fruit is eaten when ripe, or pickled or made into curries when green and tender. The flower-buds also make a very agreeable curry. The tree can be most easily propagated by cuttings, and is invariably thus planted in hedgerows.

Leafless Dec.-April. Fl. Mar.-May. Fr. Cold season.

XXXI. CORIARIACEÆ.

Glabrous erect shrubs with quadrangular branches. *Leaves* opposite or in whorls of three, simple, more or less entire, exstipulate. *Flowers* small, green, 2-sexual or polygamous, usually in axillary racemes. *Sepals* 5, spreading. *Petals* smaller than the sepals, fleshy, keeled within, sometimes adnate to every second stamen, accrescent in fruit. *Disk* none. *Stamens* 10, hypogynous; filaments short. *Carpels* usually 5, free, 1-celled; ovule solitary, pendulous; styles fleshy, feathered.

Fruit of 5-10 compressed nuts, encircled by the fleshy petals; seeds compressed.

1. *Coriaria*, Linn.

1. *C. nepalensis*, Wall.; Fl. Br. Ind. ii. 44; Brandis For. Flora 128, Ind. Trees 209. Gamble Man. Ind. Timb. 224. The Mussoorie-berry. Vern. *Mansûri*, *Masûri*, Mussoorie; *Mosroi*, Jaunsar; *Gangeru*, *Gangâra*, Tons Valley.

A large shrub with long spreading branches; bark reddish-brown, rough; branchlets quadrangular. *Leaves* 2-4 by 1-2.5 in., ovate-oblong, cordate, acuminate, obscurely serrulate, 3-7-nerved at the base, sometimes puberulous beneath; petiole 0.1 in. long. *Racemes* 2-6 in. long, usually clustered. *Flowers* .3 in. diam., greenish-yellow. *Fruit* .2-.3 in. diam., dark-brown or black.

JAUNSAK and TEHRI-GARHWAL, 4,-8,000 ft., fairly common among shrubby vegetation on hill-sides and in ravines. Occasionally in the SAHÂRANPUR SIVALIKS, e.g., Chilla-wâli Râu.

Wood grey, hard, beautifully mottled, and takes a good polish; weight 47 lbs. per c. ft. It is fit to be used for picture-frames and other small articles. The branches are browsed by sheep and goats.

Fl. April, May. Fr. June, July.

XXXII. MORINGACEÆ.

Deciduous trees with corky bark and soft spongy wood. *Leaves* alternate, imparipinnately twice or thrice compound; leaflets opposite, entire, caducous. *Inflorescence* an axillary panicle. *Flowers* 2-sexual, irregular, white or pink. *Calyx* cup-shaped, with 5 deciduous petaloid segments. *Petals* unequal, erect, spreading. *Disk* lining the calyx-tube. *Perfect stamens* 5, opposite the petals, alternating with 5 antherless filaments, all inserted on the edge of the disk and all declinate; anthers 1-celled. *Ovary* stipitate, lanceolate, 1-celled;

ovules numerous, on parietal placentas; style slender, tubular. *Fruit* a pod-like capsule, rostrate, 3-angled, 3-valved. *Seeds* many: testa corky, usually winged.

1. *Moringa*, Lamk.

1. *M. pterygosperma*, Gaertn.; Fl. Br. Ind. ii. 45; Brandis *For. Flora* 129, *Ind. Trees* 209; Gamble *Man. Ind. Timb.* 224. *The Horse-radish tree*. Vern. *Sanjui*, *Sanjua*, *Sohjua*, *Sondua*, Hind; *Shobhánjara*, Sans.

A fairly large tree with thick corky bark; roots pungent. *Leaves* 1-2.5 ft. long, usually 3-pinnate; petiole sheathing at the base; pinnae opposite, 4-6 pairs; pinnulae opposite, 6-9 pairs, the uppermost pair 1-foliolate; a hairy gland between each pair of pinnae and pinnulae. *Ultimate leaflets* opposite, 4-8 in. long, obovate, or elliptic, entire, membranous, pale beneath. *Flowers* 1 in. diam., strongly honey scented. *Sepals* linear lanceolate, reflexed. *Petals* 7-9 in. long, linear-spathulate, white, with yellow dots near the base. *Filaments* villous at the base. *Ovary* hairy. *Capsule* 9-20 by 6-8 in., 3-gonous, linear, pendulous, longitudinally ribbed, slightly constricted between the seeds. *Seeds* 3-cornered, winged at the angles, about 1 in. long including the wings.

Common in the DÚS along the banks of the Jumná, Sōng, and Suswá rivers; also found in the SAHÁRANPUR SIWALIKS, along the raus, and in the Tons valley in JAUNSAAR and TEHRI-GARHWAL. Cultivated at DEHRA for the fruit.

The wood is absolutely useless, rotting away in a few months. The leaves, flowers, and fruits are eaten as vegetables. The tender fruit is sometimes pickled. Most wild trees, however, produce bitter flowers and fruits which are therefore not edible. The leaves are also lopped for fodder, especially for camels. A gum, obtained by making incisions in the bark, as well as the pungent roots, are used in medicine. The tree is most easily propagated by cuttings.

Fl. Feb.-April. Fr. May, June.

CALYCIFLORAE.

Order 1.—ROSALES.

XXXIII. LEGUMINOSÆ.

TREES, shrubs or herbs. *Leaves* alternate, usually compound, stipulate. *Inflorescence* an axillary or terminal simple raceme or panicle. *Flowers* 2-sexual, regular or irregular, bracteate. *Sepals* 5, connate or free, in the former case often 2-lipped. *Petals* free, usually 5, equal or unequal. *Stamens* normally 10, sometimes fewer by suppression or indefinite; filaments free or variously combined; anthers usually dehiscing longitudinally. *Ovary* free, often stipitate; carpel solitary; ovules one or more on the ventral suture of the carpel; style simple. *Fruit* a pod (*legume*), usually dehiscent along one or both sutures. *Seeds* flat or more or less compressed, with a horny or coriaceous testa, very rarely albuminous.

This large and most important Family is divided into three Sub-Families:—

Analysis of the Sub-Families.

- | | |
|--|-----------------|
| Petals unequal, free, imbricate; stamens
up to 10. | |
| Stamens diadelphous, less frequently
monadelphous, rarely free; calyx
gamosepalous | I. PAPILIONÆÆ. |
| Stamens free; calyx divided to or
nearly to the base | II. CÆSAPINIÆÆ. |
| Petals equal, more or less connate, valvate;
stamens usually indefinite | III. MIMOSÆÆ. |

SUB-FAMILY I. *PAPILIONÆ*.

Mostly herbs, less frequently shrubs or trees. *Leaves* pinnate or digitate; leaflets often stipellate. *Flowers* 2-sexual, irregular. *Calyx* gamosepalous, 2-lipped. *Corolla* of 5 imbricate petals which are more or less clawed, the 2 innermost (which are also anterior) similar, free or connate into a sheath next to the ovary and are called the *keel* petals; the next two are immediately outside the keel, also similar, and are called the *wings*; and the fifth is the outermost or odd petal, called the *standard*, which is posterior in position and is generally broad and reflexed. This type of corolla is known as *papilionaceous*, whence the name of the Sub-Order. *Stamens* generally 10, diadelphous, sometimes monadelphous, rarely free, inserted with the petals on the calyx-tube; anthers often versatile. *Pod* dry, generally dehiscent. *Seeds* exalbuminous.

Analysis of the Genera.

- | | |
|---|-----------------|
| Leaves digitately 3-foliolate; pod compressed; stamens free | 1. PIPTANTHUS. |
| Leaves digitately 3-foliolate or simple; pod inflated. | |
| Leaves not gland-dotted; stamens monadelphous | 2. CROTALARIA. |
| Leaves gland-dotted; stamens diadelphous | 20. FL'EMINGIA. |
| Leaves imparipinnate. | |
| Stamens free; (pod moniliform, indehiscent) | 22. SOPHORA. |
| Stamens equally or unequally diadelphous. | |
| Leaflets alternate; pod indehiscent | 21. DALBERGIA. |
| Leaflets opposite; pod dehiscing sooner or later. | |
| Pod cylindrical; stamens apiculate | 3. INDIGOFERA. |
| Pod compressed; stamens obtuse. | |
| Pod few-seeded, tardily dehiscent | 4. MILLETTIA. |
| Pod many-seeded, soon dehiscent | 5. TEPHROSIA. |

Leaves paripinnate ; stamens diadelphous.

Unarmed. Pod septate ; calyx not oblique.

Pod long, many-seeded. Erect plants 6. *SESBANIA*.

Pod short, few-seeded. Climbing plants 12. *ABRUS*.

Armed. Pod not septate ; calyx very oblique 7. *CARAGANA*.

Leaves pinnately 3-foliolate.

Stamens diadelphous.

Pod indehiscent, 1-seeded 8. *LESPEDeza*.

Pod dehiscent, 2 or more-seeded.

Pods twisted inside the calyx 9. *URARIA*.

Pods not twisted inside the calyx.

Pod with articulate joints.

Trees. Racemes fascicled, on old wood 10. *OUGEINIA*.

Shrubs. Racemes simple or panicled, on current year's shoots (leaves often 1-foliolate) 11. *DESMODIUM*.

Pod without articulate joints.

Nodes of racemes tumid ; leaves not gland-dotted.

Petals very unequal ; pod few-seeded.

Keel exceeding the wings and standard. Climbing shrubs 13. *MUCUNA*.

Standard exceeding the keel and wings. Trees. 14. *ERYTHRINA*.

Petals equal : pod 1-seeded.

Flowers small, panicle 15. *SPATHOLOBUS*.

Flowers large, racemed 16. *BUTEA*.

Nodes of racemes not tumid ; leaves gland-dotted beneath.

Ovules 3-many ; pods with compressed lines between the seeds 18. *ATYLOSIA*.

Ovules 1-2 ; pods without compressed lines between the seeds 19. *RHYNCHOSIA*.

Stamens monadelphous (pod dehiscent, not jointed, few-seeded) 17. *PUERARIA*.

1. *Piptanthus*, D. Don.

1. *P. nepalensis*, D. Don ; Fl. Br. Ind. ii. 62 ; Brandis For. Flora 132, Ind. Trees 216 ; Gamble Man. Ind. Timb. 229. Vern. *Chamba*, *Chamboá*, *Jaunsar*.

A shrub 8 to 12 ft. high, with green bark. *Leaves* digitately 3-foliate; common petiole .7-1.5 in.; stipules connate, opposite to the petiole, .2-.3 in. long, broadly triangular, drying brownish-grey, pubescent, deciduous. *Leaflets* sessile, 2.4 by .5-1 in., lanceolate or narrow-elliptic, acuminate, entire, dark-green above, pale beneath, grey-pubescent when young, afterwards glabrous and shining; midrib prominent beneath; main lateral nerves about 12 pairs, faint. *Flowers* yellow, about 1.25 in. long, in short compact hairy racemes 4-5 in. long; peduncle triquetrous; pedicels .5-.7 in. long; bracts ternate, tomentose. *Calyx* about .5 in. long, campanulate, densely white-pubescent, deciduous from the base. *Petals* bright-yellow, all clawed, 1 in. long including the claw which is about .5 in. long. *Stamens* 10, free, equal or frequently alternately long and short; anthers uniform. *Ovary* linear, stipitate, hairy. *Pod* 3-5 by .4-.5 in., flat, narrowed at both ends, on a stipe .8-1 in. long; seeds 3-10.

JAUNSAR and TEHRI-GARHWAL, 7,-9,000 ft. Deoban near "Chakrata View" and below "Snow View"; on the slopes of the Karāmba peak and elsewhere about Mundāli. Common about the temple in the Temple Block, Deotā Forest.

Planted for ornament in the hills on account of its handsome yellow flowers.

Fl. April-June. Fr. Aug., Sept.

2. *Crotalaria*, Linn.

The Kidney Beans.

Herbs or shrubs. *Leaves* simple or 3-foliate, rarely imparipinnate. *Flowers* yellow, blue or purplish, in terminal or leaf-opposed lax racemes. *Calyx-tube* short; teeth almost equal, or connate and 2-lipped. *Corolla* generally showy; standard shortly clawed, round; wings and keel of the same length; the latter broader, beaked. *Stamens* monadelphous, forming an open sheath; anthers alternately versatile and basifixed. *Ovary* linear; style incurved at the base, bearded. *Pod* inflated.

This large Genus is noted for strong fibre.

Analysis of the Species.

- Corolla much exserted ; pod glabrous . . . 1. *C. sericea*.
 Corolla little exserted ; pod densely vel-
 vety 2. *C. tetragona*.

1. *C. sericea*, Retz. ; Fl. Br. Ind. ii. 75. Vern. *Chhánmuna*. Hind. ; *Sanni*, E. Dún.

An undershrub 4-6 ft. high with stout but fleshy striated branches. *Leaves* simple, 3-6 by 2-3·5 in., oblanceolate-oblong, tapering into a short petiole, subcoriaceous but soft, glabrous above, finely silky beneath ; stipules leafy, persistent. *Racemes* terminal, about a foot long. *Calyx* ·5 in. ; teeth lanceolate. *Corolla* ·7-8 in. long, golden-yellow. *Pod* 1-2 by ·7-8 in., smooth ; seeds kidney-shaped, many, imbricating in two rows, on long funicles.

Common in fallow lands and forest-glades in the DÚN and in the SAHÁRANPUR SIWALIKS ; Doiwála, Phándowála, Karwápáni, Dholkhand, etc.

The stem yields a fairly strong fibre.

Fl. & Fr. Nov.-Mar.

2. *C. tetragona*, Roxb. ; Fl. Br. Ind. ii. 78 ; Gamble Man. Ind. Timb. 230.

A stiff shrub, 4-6 ft. high ; branches quadrangular, silky. *Leaves* 6-12 by ·5-1·5 in., linear or lanceolate, acuminate, membranous, thinly silky or glabrescent ; stipules usually 0. *Racemes* 6-8 in. long, few-flowered. *Flowers* 1-1·5 in. long. *Calyx* ·7-1 in. long, brown-velvety. *Corolla* yellow, very slightly exserted. *Pod* 1·5-2 in. long, densely dark-brown-velvety, 12-20-seeded.

Ráu-beds in the SAHÁRANPUR SIWALIKS ; Timli Pass. Also in the DÚN ; Nakraunda, Lachiwála, etc.

Fl. Sept.-Nov. Fr. Mar.-June.

The following species also deserve mention :—

C. juncea, Linn., Fl. Br. Ind. ii. 79 Vern. *Sanai*, *Sann*. The Sun Hemp.

A shrub 4-6 ft. high with virgate, grooved stems and branches and linear or linear-oblong leaves 1·5-3·5 in. long. *Flowers* 1 in. long yellow, in lateral and terminal racemes about a foot long. *Pod* 1-1·5 in. long, clothed with persistent silky hairs. Cultivated and sometimes apparently wild in the Dún and Saháranpur Districts. It yields the *sun* fibre.

C. alata, Buch.-Ham. ; Fl. Br. India ii. 69. A densely hairy sub-erect undershrub, 1-2 ft. high. *Leaves* simple, subsessile,

elliptic oblong or obovate, 1-3 in. long; *stipules* persistent forming decurrent wings on the stems and branches. *Racemes* 2-3-flowered. *Corolla* pale-yellow, hardly exserted. *Pod* 1-1.75 in. long, glabrous.

Dehra Dun; Lachiwala; Jaunsar, and Tehri-Garhwal, ascending to 6,000 ft.; Thadiar, Rampur mandi.

C. albida, Heyne.: Fl. Br. Ind. ii. 71. An erect or diffuse, much branched, perennial herb or undershrub, 1-2 ft. high. *Leaves* simple, nearly sessile, linear or oblanceolate-oblong, gland-dotted 1-2 in. long. *Flowers* about .35 in. long, yellow, racemed. *Pod* glabrous, .5 in. long.

Common in the Dun and hills up to 6,000 ft.; Ramgarh; Lambatach; Timli Pass; Nala pani; etc.

3. *Indigofera*, Linn.

Herbs or shrubs clothed with adpressed white hairs. *Leaves* usually imparipinnate; leaflets entire. *Inflorescence* a copious axillary raceme. *Calyx* small, campanulate, 5-toothed. *Standard* ovate; *keel* at first held in a bent position by spurs on either side which catch on the wings, but straightens afterwards with a sudden jerk—a contrivance in nature for the dissemination of pollen. *Stamens* diadelphous; anthers apiculate. *Ovary* sessile, many-ovuled; style glabrous, stigma capitate. *Pod* usually linear-cylindrical and straight.

Analysis of the Species.

Dwarf shrubs with a thick woody root-stock; stems mainly annual.

Leaflets 3-9 1. *I. Hamiltonii*.

Leaflets 15-37 2. *I. Dosua*.

Erect shrubs with perennial stems.

Bracts minute, shorter than the calyx . . . 3. *I. heterantha*.

Bracts as long as or longer than the flower buds.

Bracts lanceolate; corolla deep purple-red 4. *I. atropurpurea*.

Bracts boat-shaped.

Leaflets 1-1.5 in. long; corolla deep red 5. *I. hebeptala*.

Leaflets .6-.9 in. long; corolla pink . 6. *I. pulchella*.

1. **I. Hamiltonii**, R. Grah. ; Syn.—*I. atropurpurea*, Fl. Br. Ind. II. 101, in part (not of Ham.).

A low deciduous undershrub with a thick woody rootstock ; branches numerous, diffuse, thinly adpressed hairy. *Leaves* 1-2.5 in. long ; *leaflets* usually 3-5, rarely 9, opposite, .4-.8 in. long, obovate or oblong, often emarginate, membranous, sparsely adpressed pubescent on both surfaces ; *stipules* small, caducous. *Flowers* pink tinged with red, .4-.5 in. long, in long-peduncled racemes 8-12 in. long, springing from the woody rootstock ; *bracts* lanceolate, caducous, shorter than the pedicels. *Pod* 1-1.5 in. long, ligulate, straight, compressed. Seeds 9-10.

Open grasslands in the Dún, which are subject to periodical fires—e.g., Ramgarh, etc.

Fl. Mar.-July.

2. **I. Dosua**, Ham. ; Fl. Br. Ind. ii. 102 ; Brandis Ind. Trees 218.

A small densely pubescent shrub with slender branches from a thick woody rootstock. *Leaves* 2-4 in. long ; *leaflets* 17-35, opposite, .3-.5 in. long, elliptic, or oblong, mucronate, more or less densely adpressed hairy on both surfaces, dull green above, pale beneath ; *stipules* setaceous. *Flowers* bright red, about .5 in. long, in peduncled racemes 1.5-3.5 in. long ; *bracts* narrowly lanceolate, long-pointed, silky, much longer than the flower-buds. *Pod* about 1 in. long, straight, minutely pubescent.

Common in grass-lands and fire-traces in the Hills ; Lokhar ; Ringali ; Bhāshla, etc.

Fl. May-June.

3. **I. heterantha**, Wall. ; Brandis For. Flora 135, Ind. Trees 218 ; Gamble Man. Ind. Timb. 230. Syn.—*I. Gerardiana*, Wall. var. *heterantha* ; Fl. Br. Ind. ii. 100. Vern. *Káthi*, *Káthoi*, Jaunsar ; *Sákiná*, Garhwal.

A shrub with brown bark ; branchlets white-canescens. *Leaves* 1.5-2.5 in. long, short-petioled. *Leaflets* 13-31, opposite, .2-.3 in. long, obovate, mucronate, subcoriaceous, pale-grey beneath, clothed with short white hairs above ; stipels and bracts minute. *Racemes* 1-2.5 in. long, shortly peduncled. *Flowers* .25-.4 in. long. *Calyx* campanulate, hairy outside. *Corolla* .2-.4 in. long, red. *Pod* .6-1 in. long, spreading, cylindrical, with a few scattered hairs.

JAUN SAR and TEHRI-GARHWAL, 3,8,500 ft., from Saiá all the way to Deotá, Lambátách, etc.

The twigs are used for basket-work. The shrub is gregarious and has some value as fuel near hill-stations like Chakrata.

Fl. May, June. Fr. Sept.-Nov.

I. Gerardiana, Wall., Fl. Br. Ind. i. 100. Is a larger plant with fewer leaflets, but larger flowers and pod. It is less common; Koti-Kanásur, Deotá, etc.

4. ***I. atropurpurea***, Hamilt.: Fl. Br. Ind. ii. 101. Brandis For. Flora 136, Ind. Trees 217; Gamble Man. Ind. Timb. 230, Vern. *Káthi*, *Káthoi*, *Dande-ká Kátha*, Jaunsar; *Kála Sákiná*, Garhwal.

A tall shrub; branchlets glabrescent. *Leaves* imparipinnate, 4-8 in. long; petiole 1-3 in. long. *Leaflets* 5-13, opposite, .8-2 by .6-1 in., ovate, obovate or elliptic, membranous, glabrescent, dark-green; stipels minute. *Racemes* 4-6 in. long; peduncle 1-2 in.; bracts lanceolate, exceeding the buds. *Flower* .3-.4 in. long. *Calyx* about .1 in. long, obliquely campanulate, with scattered white hairs outside. *Corolla* deep-pink or dark-purple. *Pod* linear, turgid, glabrous not narrowed into a beak.

Occurs in the hills between 3,000 and 4,000 ft. but there are no specimens in Herb. Dehra.

Economic use as of the foregoing species.

Fl. June, July.

5. ***I. hebetepetala***, Benth.: Fl. Br. Ind. ii. 101; Brandis Ind. Trees 217; Gamble Man. Ind. Timb. 231.

A tall shrub; branchlets glabrescent. *Leaves* imparipinnate, 4-6 in. long. *Leaflets* 7-17, opposite, usually 1-1.5 in. long, ovate, obtuse, membranous, dull-green above, pale beneath; stipels distinct. *Racemes* 2-4 in. long, few-flowered, peduncled; bracts boat-shaped, bristly at the tip, exceeding the buds. *Calyx* .1 in. long, obliquely campanulate. *Corolla* .5 in. long, deep-red. *Pod* glabrous, 1.5-2 in. long, 8-10-seeded.

JAUN SAR, 7,-10,000 ft., generally in shady places: Jhálkúri, Konáin, etc.

The stems and branches are used for fuel.

Fl. May, June.

6. ***I. pulchella***, Roxb.: Fl. Br. Ind. ii. 101; Brandis For. Flora 136, Ind. Trees 217; Gamble Man. Ind. Timb. 231. Vern. *Níl*. Hind.; *Sákiná*, Dún and Garhwal.

A shrub 10-12 ft. high; branchlets glabrescent. *Leaves* imparipinnate, 3-6 in. long. *Leaflets* 13-21, opposite, .6-.9 by .3-.4 in., obovate-oblong, subcoriaceous, pale-green above, glaucous beneath,

with adpressed grey hairs on both surfaces; stipels minute or 0. *Racemes* 1-4 in. long, moderately compact, short-peduncled; bracts boat-shaped, exceeding the buds. *Calyx* about .1 in. long, white canescent; teeth short. *Corolla* about .5-.8 in. long, rose-coloured, standard reflexed. *Pod* 1-2-1.7 in. long, straight, turgid, glabrous, 8-12 seeded; sutures broad.

Sál forests of the DÚN and the SIWALIKS, and the HILLS up to 9,000 ft., very common in some localities, e.g., Karwáñni; Konáin, Mundáli, etc.

The branches are often used for fences, and also for fuel.

Fl. Nov.-Mar., according to elevation. Fr. Rainy season.

I. hirsuta, Linn.; Fl. Br. Ind. ii. 98;—is a short suberect herbaceous plant with stems densely clothed with brown pubescence. *Racemes* 2-4 in. long, very dense. *Flowers* red. *Pod* .7-1 in. long, densely pubescent. Found in grass-lands and ráu-beds in the SIWALIK TRACTS. Phándowála, Ráñipur, etc.

2. *I. tinctoria*, Linn.; Fl. Br. Ind. ii. 99; Brandis For. Flora 135, Ind. Trees 218; Gamble Man. Ind. Timb. 230. Vern. Níl. The Indigo plant, is a shrub 2-6 ft. high. *Flowers* greenish, rose-coloured. *Pods* 1-1.5 in. long. Found as a weed of cultivation in the Dún; Lachiwála; Raipur, etc.

4. *Millettia*, W. & A.

1. *M. auriculata*, Baker; Fl. Br. Ind. ii. 108; Brandis For. Flora 138, Ind. Trees 219; Gamble Man. Ind. Timb. 232. Vern. *Gauj*, Hind.

A large woody gregarious climber. *Leaves* 1-2 ft. long, crowded at the ends of the branches; petiole with a swollen base. *Leaflets* 7-9, lateral opposite, 3-8 by 2-5 in., obovate elliptic or oblong, abruptly acuminate, entire, subcoriaceous, densely grey-silky when young, afterwards glabrescent above, pale beneath; stipels minute. *Racemes* 4-10 in. long, axillary; rachis downy. *Flowers* .3-.4 in. long, dull-white, fascicled on the rachis. *Calyx* about .1 in. long, shortly toothed, densely silky. *Corolla* .3-.4 in. long, silky all over; standard auriculate above the claw (whence the specific name); wings falcate; keel-petals incurved. *Stamens* monadelphous (though generally diadelphous in the Genus). *Style* filiform, incurved glabrous; stigma capitate. *Pod* 4-7 by 1-1.5 in., hard, brown-velvety, with very thick sutures.

Extremely common and a pest in the DÚN and SÁHARANPUR FORESTS; also found in the Tons Valley and elsewhere in JAUNSAR and TEHRÍ-GARHWÁL, up to 3,000 ft.

The branches when beaten give a coarse fibre which is used for rough cordage. They are also made into brushes for daubing trees with paint. The leaves and twigs are lopped for cattle-fodder and eaten by elephants.

Fl. May, June. Fr. Cold season.

5. *Tephrosia*, Pers.

1. *T. candida*, DC. ; Fl. Br. Ind. ii. 111; Brandis For. Flora 138; Gamble Man. Ind. Timb. 234. Vern. *Kulthi*, *Loshtia*, *Dún*; *Masethi*, *Málkōt*

A low shrub; branches grooved, clothed with brown or grey velvety pubescence. *Leaves* imparipinnate, 5-9 in. long, short petioled; stipules setaceous. *Leaflets* 19-25, opposite, 2-3 by .3-.7 in., narrow-elliptic, acute at both ends, entire, coriaceous, dark-green and glabrous above, pale and silky beneath; lateral nerves numerous, straight, very fine; midrib prominent. *Racemes* 6-9 in long, terminal and lateral, often fascicled; pedicels .3-.5 in. long, silky. *Calyx* campanulate, .15-.2 in. long, short-toothed, silky. *Corolla* .7-1 in. long, white with a shade of red; petals clawed, standard suborbicular, densely silky. *Stamens* diadelphous. *Pod* 3-4 by .3 in., 10-12 seeded, continuous, slightly recurved, clothed with adpressed brown silky hairs, generally tipped with the persistent style.

Common in some parts of the DÚN, e.g., Chandrabani, Rám-garh, Bindál-nálá, Bidhalna Block, etc.

Much planted as a fertiliser in tea-gardens in Assam. The leaves and bark are used to intoxicate fish.

Fl. Aug., Sept. Fr. Nov., Dec.

T. purpurea, Pers.; Fl. Br. Ind. ii. 112. Vern. *Sarphoka*. A copiously branched, perennial, pubescent herb or under-shrub; stems erect 1-2 ft.; rootstock woody. *Leaves* odd-pinnate, 3-5 in. long; *leaflets* 9-21, oblong-ob lanceolate .5-1 in. long, bristle-tipped at the apex. *Flowers* red, .25-.32 in. long, in leaf-opposed racemes. *Pod* 1.5-2 in. long, minutely pubescent, slightly recurved at the tip.

Common in grassy places, ascending to 6,000 ft. Siwaliks, Kohtri valley, etc. Fl. Rainy season.

6. *Sesbania*, Pers.

1. *S. aegyptiaca*, Pers.; Fl. Br. Ind. ii. 114; Brandis For. Flora 137, Ind. Trees 219; Gamble Man. Ind. Timb. 235. Vern. *Juent*, *Hid*.

A soft-wooded shrub 10-15 ft. high, of brief duration. *Leaves* paripinnate, 3-6 in. long. *Leaflets* 9-20 pairs, .6-1 by .1-.2 in., linear-oblong, minutely petioluled, membranous, glabrous, pale-green. *Racemes* 3-6 in. long, axillary, few-flowered; pedicels about .2 in. long. *Flowers* pale-yellow. *Calyx* campanulate, .2 in. long, short-toothed, membranous, glabrous. *Petals* .5-.7 in. long, yellow, often with purple spots. *Stamens* diadelphous. *Pod* 6-9 by .15 in., torulose, flexible, twisted, 20-30 seeded, septate between the seeds.

Cultivated throughout the plains of India for its very rapid growth and shade-yielding capacity.

Wood white, extremely soft, weighing about 27 lbs. per c. ft. It is said to give the best gunpowder charcoal. The fibre of the bark is used for rope, and the leaves and tender branches for cattle-fodder.

Fl. Aug., Sept. Fr. Dec.-Feb.

S. aculeata, Pers. var. *elatio*r, Prain. is an erect shrub-like annual reaching up to 8 ft. or so in height with many more leaflets than the above. It is occasionally met with as a rainy season weed in various parts of the area.

7. Caragana, Lam.

1. ***C. brevispina***, Royle; Fl. Br. Ind. ii. 116; Brandis For. Flora 133, Ind. Trees 216; Gamble Man. Ind. Timb. 236. Vern. *Ári*, *Kathúr*, *Kantá*, Jaunsar.

An erect spinescent shrub, 6-8 ft. high; young branches finely downy. *Leaves* paripinnate, 2-4 in. long; rachis finally spinescent. *Leaflets* 8-16, variable, .3-.6 by .2-.5 in., obovate, pubescent beneath, minutely petioluled. *Racemes* 2-3 in. long, umbellately 1-3-flowered; pedicels downy, bracteate. *Calyx* campanulate, placed very obliquely on the pedicel, .3-.4 in. long, pubescent; teeth acute. *Petals* yellow, .6-1 in. long, all of nearly the same length; standard broad, reflexed, much thicker and firmer than the other petals. *Stamens* diadelphous. *Style* incurved, glabrous. *Pod* 2-3 in. long, straight, cylindrical, turgid, glabrous outside, woolly inside.

JAUNSAR and TEHRI-GARHWAL, 6,-9,000 ft. Common at Konáin, Mundáli and Deotá.

Fl. April-June. Fr. Aug.-Oct.

C. sikiensis, C. K. Schn. A diffuse undershrub about 2 ft. high differing from the above in having smaller leaves and leaflets, subsessile flowers, and shorter pods which are pubescent outside. It is sometimes confused with *C. Gerardiana*, Royle from which

it can always be distinguished by the long auricle of the wing petals, and by the stipules.

Tehri-Garhwal, Jaunsar and Morru Blocks 8,-9,000 ft. Flowers June.

8. *Lespedeza*, Mich.

Herbs or undershrubs. *Leaves* pinnately 3-foliolate without stipels. *Flowers* axillary, fascicled or racemed. *Calyx-tube* campanulate; teeth long. *Corolla* exserted; standard broad. *Stamens* diadelphous. *Ovary* sessile or stipitate, 1-ovuled; style long, incurved, often persistent; stigma minute. *Pod* 1-seeded, small, oblong, compressed, reticulate, indehiscent.

Analysis of the Species.

- | | |
|---|---------------------------|
| Leaflets much longer than broad; flowers in sessile clusters; keel obtuse. Pod shorter or about as long as calyx. | |
| Flowers .25-.3 in. long; pod about as long as the calyx | 1. <i>L. sericea</i> . |
| Flowers .5 in. long; pod much shorter than the calyx | 4. <i>L. Gerardiana</i> . |
| Leaflets about as long as broad; flowers in racemes; keel acute. Pod much longer than calyx. | |
| Leaflet .5 in. long; racemes 1 in. or less; bracts persistent | 2. <i>L. stenocarpa</i> . |
| Leaflets 1-1.3 in., racemes 3-6 in.; bracts mostly deciduous | 3. <i>L. eri carpa</i> . |

1. *L. sericea*, Miq.: Fl. Br. Ind. ii 142. Vern *Khúnjú*, Dún.

An erect undershrub, 2-4 ft. high, with long slender branches. *Leaves* ascending; petiole short. *Leaflets* .3-.6 by about .1 in., linear-cuneate, emarginate, minutely petioluled, rigidly coriaceous, usually glabrous above, adpressedly silky-hairy beneath. *Flowers* 2-4 together in the axils of the leaves; pedicels short; bracteoles minute. *Calyx* .1 in. long, canescent, teeth very long. *Corolla* about .2 in. long, white but tipped with purple. *Pod* .1 in. long, thinly silk; style .2 in. long, persistent.

JAUNSAK and the DÚN. Lachiwála, Rámgarh ; Chakrata.
Fl. May, June. Fr. Oct., Nov.

2. ***L. stenocarpa***, Maxim. : Prain's Additional Leguminosæ in Journ. As. Soc. Beng. lxvi, Part II, No. 2, 376 ; Gamble Man. Ind. Timb. 236. Syn.—*L. macrostyla*, Baker (in part) ; Fl. Br. Ind. ii. 143.

An undershrub, 3-5 ft. high ; branches densely white-pubescent. *Petiole* .5-.7 in. long. *Leaflets* .5-.8 by .4-.6 in., obovate-cuneate, often emarginate, rigidly subcoriaceous, white-silky beneath. *Racemes* short, dense, silky ; buds hidden by ovate silky bracts ; pedicels .1-.2 in. long. *Calyx* .1 in. ; teeth longer than the tube. *Corolla* .4-.6 in. long, red. *Pod* .5 in. long, shortly stalked, narrow-oblong, densely grey-silky, gradually tapering to the base of the persistent hairy style.

Common in the SIWALIK TRACT, on steep sandy hill-slopes and banks of ráus. Mohand Pass, Dholkhand, Ránipur, etc. Also low elevation in the HILLS.

Fl. Aug., Sept. Fr. Dec.-Feb.

3. ***L. eriocarpa***, DC. ; Fl. Br. Ind. ii. 144 ; Gamble Man. Ind. Timb. 236.

A much-branched erect shrub, 3-4 ft. high ; branchlets slender, angular, furrowed, silky. *Petiole* (except in var. *Falconeri*, Prain) longer than in the above two species, sometimes up to 1.5 in. ; stipules setaceous .2-.3 in. long. *Leaflets* .3-1 in. long, obovate cuneate, adpressedly silky-hairy beneath. *Racemes* 2-3 in. long, rather lax, peduncled ; bracts not exceeding the buds ; pedicels .15-.2 in. *Calyx* .15 in. long ; teeth much longer than the tube. *Corolla* .4-.5 in. long, bright-pink. *Pod* .2-.3 in. long, coriaceous ; style as long as the pod, pubescent near the base.

Fairly common in JAUNSAK and TEHRI-GARHWAL, 4,800 ft. Lúrlí, Missáu, Kathián, Tons Valley, etc.

Fl. May-Sept. Fr. Cold season.

4. ***L. Gerardiana***, Grah. ; Fl. Br. Ind. ii. 142.

A shrub 1-3 ft. high, densely pubescent. *Leaves* shortly stalked, ascending ; *leaflets* .5-.75 in. long, oblanceolate, rigidly coriaceous, glabrescent above, densely grey-silky beneath ; *petioles* .12-.25 in. long. *Flowers* nearly sessile, in 4-8-flowered umbels, in the axils of leaves, rarely shortly peduncled. *Bracts* linear, half as long as the calyx. *Calyx* grey silky, teeth linear-subulate, much exceeding the tube. *Corolla* .4-.5 in. long, pale-yellow, keel obtuse, slightly curved, tipped with purple. *Pod* .1 in. long, grey-tomentose, much shorter than the calyx.

Jaunsar and Tehri-Garhwal, 4,-8,000 ft.. Mussoorie ; Landour, etc.

Fl. Aug.-Oct.

9. *Uraria*, Desv.

Herbs with perennial rootstock or undershrubs. *Leaves* pinnately 3-9-foliate or sometimes 1-foliate ; *Leaflets* stipellate. *Flowers* numerous in racemes. *Calyx-tube* short, two upper teeth short ; 3 lower, usually elongated, setaceous. *Corolla* purple or yellow. *petals* clawed ; standard broad, wings adhering to the obtuse keel. *Stamens* diadelphous ; *anthers* uniform. *Ovary* sessile or shortly stipitate, few-ovuled. *Style* filiform, inflexed. *Stigma* terminal. *Pod* of 2-6, small, turgid, 1-seeded, indehiscent joints often placed face to face.

Analysis of the Species.

- | | |
|---|-------------------------|
| Upper leaves 5-9 foliate | 1. <i>U. picta</i> . |
| Upper leaves 3-foliate, lower usually 1-foliate. | |
| Lower calyx-teeth elongated ; pod hairy | 2. <i>U. lagopus</i> . |
| Calyx-teeth subequal. | |
| Pod glabrous | 4. <i>U. neglecta</i> . |
| Pod hairy | 3. <i>U. hamosa</i> . |

U. picta, Desv. ; Fl. Br. Ind. ii. 155. Vern. *Prishniparni* ; *Prishtiparni*.

A sparingly branched erect perennial, 3-6 ft. high ; stems finely pubescent. *Leaves* 6-12 in. long, the lowest simple or 3-foliate ; upper 5-9-foliate ; *stipules* 5 in. long, lanceolate, acuminate ; *leaflets* 4-8 in. long, by 4-1 in. broad, linear-oblong, rigidly coriaceous, glabrous and blotched with white above, reticulate-veined and minutely pubescent beneath ; *petiolules* .05-1 in. long ; *stipels* subulate, longer than the petiolules. *Flowers* in dense cylindrical racemes 6-12 in. long ; *bracts* brown, scarious, deciduous ; *pedicels* 2-3 in. long, abruptly incurved at the tip after flowering, bristly with hooked hairs. *Calyx* 2 in. long, teeth plumose, unequal. *Corolla* exserted, purple. *Pod* glabrous, pale lead-coloured or whitish, 3-6-jointed, joints polished.

Dehra Dun and the outer Himalaya : Lachiwála ; Karwapani, etc.

2. **U. lagopus**, DC. ; Fl. Br. Ind. ii. 156 (in part).

An erect undershrub. Stem, petiole and rachis of inflorescence pubescent and bristly. *Leaves* 1 and 3-foliate ; *petiole* 2-3·5 in. long ; *stipules* 3-4 in. long, lanceolate, acuminate, from a broadly cordate base ; *leaflets* 2-4 in. by 1·5-2 in., ovate or ovate-oblong, obtuse or emarginate, mucronate, subcoriaceous, scabrous above, paler and tomentose beneath, strongly net-veined. *Racemes* mostly terminal, cylindric, 6-12 in. long, often panicle ; *pedicels* 3-4 in. long, incurved at the tips after flowering ; *bracts* ovate-acuminate, densely ciliate, caducous. *Calyx* 2 in. long, teeth plumose, the lower ones elongated. *Corolla* purple, 3 in. long. *Pod hairy*, 2-6 jointed.

Dehra Dun and the outer Himalaya between 3,000 and 4,000 ft., e.g., Lachiwála etc.

4. **U. neglecta**, Prain. ; Jour. As. Soc. Beng. LXVI, part 2 (1897), 382. Syn.—*U. lagopus* ; Fl. Br. Ind. ii. 156 in part (not of DC).

An erect undershrub ; branches slender, woody, shortly pubescent. *Leaves* as in *U. hamosa* : *stipules* lanceolate-acuminate ; *leaflets* large, oblong, not cordate. *Racemes* exactly as in *U. lagopus* but with bracts quite as in *U. hamosa* ; *pedicels* 2-3 times the calyx, densely crinite. *Calyx* 1·5-2 in., teeth subequal. *Corolla* purple, little exserted. *Pod* glabrous, polished, 2-6 jointed.

Found in the same localities as the above.

3. **U. hamosa**, Wall. ; Fl. Br. Ind. ii. 156.

An undershrub 3-5 ft. high, somewhat resembling a *Desmodium* ; branches shortly pubescent, hairs of 2 kinds, long straight and shorter hooked. *Leaves* 1 and 3-foliate ; *stipules* acuminate from a broad semicordate base, hairy ; *leaflets* 3-5 in. by 2-3 in., elliptic-ovate or oblong, obtuse or emarginate, rarely acute ; rounded at the base, glabrous above, adpressed hairy beneath ; *stipules* subulate-setaceous. *Racemes* 6-12 in. long, cylindrical, lax, often panicle and elongating in fruit ; bracts imbricating, ovate-cuspidate, hairy, caducous ; *pedicels* 1-2 in. long, incurved at the apex, 1-3-nate. *Calyx* 1·5 in. long, teeth subequal, finely acuminate. *Corolla* about 4 in. long, much exceeding the calyx. *Pod* puberulous, 4-6-jointed.

Same localities as the above, Nakraunda ; Raipur, Asarori, etc.

10. *Ougeinia*, Benth.

1. *O. dalbergioides*, Benth.; Fl. Br. Ind. ii. 161. Brandis For. Flora 146. Ind. Trees 224; Gamble Man. Ind. Timb. 237. Vern. *Sandan*, Hind.

A middle-sized tree with a thin ashy-grey or light-brown bark which exudes beads of red gum when cut. *Leaves* pinnately 3-foliolate, stipellate; rachis 3-6 in. long, channelled above. *Lateral leaflets* opposite, 2·5-4·5 by 1·5-3 in., obliquely elliptical; *terminal* 3-6 by 2·3-5 in., broad-ovate; all entire or obscurely crenate, coriaceous glabrous above, more or less downy or glabrescent beneath; lateral nerves about 6 pairs; petiolules 1-2 in. long. *Flowers* light-pink or white, in fascicled racemes generally from the old wood; pedicels 5-8 in. long, very slender, clustered on short branches of the raceme; bracts small, scaly. *Calyx* 1-1·5 in. long, pubescent; teeth obtuse. *Corolla* 3-4 in. long; standard nearly orbicular, shortly clawed; keel obtuse. *Pod* very distinctly jointed, 2-4 by 3 in., flat; joints 6-8 in. long. *Seeds* about 2 in. long, smooth, brown when mature.

A common tree in Sál forests in the DÚN and SAHÁRANPUR SIWALIKS and in the OUTER HIMALAYA; also found in the *chir* forests of JAUNSAH and TEHRI-GARHWAL, up to 4,000 ft., e.g., Khunigádh, Moltá, etc.

Heartwood pale or deep reddish-brown, hard, close-grained, strong, tough and durable, and takes a beautiful polish; weight 55-65 lbs. per c. ft. It is much used for agricultural implements, furniture, building, and the like. The bark yields an astringent red gum, and is pounded and used to intoxicate fish. The twigs are lopped for cattle-fodder. The tree can be most easily propagated by root-suckers.

Leafless Feb., Mar. Fl. Mar., April. Fr. May, June.

11. *Desmodium*, Desv.

Shrubs or herbs. *Leaves* pinnately 3-foliolate or 1-foliolate, stipellate. *Flowers* small, red or whitish, in axillary and terminal simple or paniced racemes, rarely umbelled. *Calyx* campanulate or turbinate. *Corolla* exserted; standard broad; wings more or less attached to the keel, which is usually obtuse. *Stamens* diadelphous, sometimes the upper stamen only partially free. *Style* incurved; stigma minute, capitate. *Pod* compressed, usually with articulate joints; joints 1-seeded,

generally indehiscent, rarely splitting open in a continuous line along the ventral suture.

Analysis of the Species.

- Flowers umbelled; leaves 3-foliolate.
- Umbels axillary, naked 1. *D. Cephalotes*.
- Umbels arranged in plicate racemes.
hidden by a pair of persistent, folia-
ceous bracts 2. *D. pulchellum*.
- Flowers in axillary and terminal, simple or
panicked racemes.
- Pods distinctly jointed and articulate;
joints generally indehiscent.
- Leaves 1-foliolate.
- Petiole winged 4. *D. pseudo-triquetrum*.
- Petiole not winged.
- Leaves entire, glabrescent above 8. *D. gangeticum*.
- Leaves repand, hispid above 6. *D. latifolium*.
- Leaves 3-foliolate.
- Stems suberect or prostrate.
- Pod slightly indented on the ven-
tral suture; joints 5-8 9. *D. polycarpum*.
- Pod deeply indented on both
sutures; joints 3-5 10. *D. parvifolium*.
- Stems erect.
- Pod stalked; flowers 12 in. long 11. *D. podocarpum*.
- Pod sessile.
- Flowers 5 in. long; racemes
much branched 5. *D. tiliacfolium*.
- Flowers 25-4 in. long.
- Bracts minute.
- Leaflets narrow, dark-green
and shining above, joints
of pods twice as long as
broad 3. *D. laburnifolium*.
- Leaflets broad; joints of
pods 3-4 times as long
as broad 14. *D. laxiflorum*.
- Bracts 2 in. long or longer.
- Petiole 1-2.5 in. long 12. *D. sambuense*.
- Petiole usually not exceed-
ing 1 in.; leaves ad-
pressed silky above 13. *D. concinnum*.

Pods indistinctly jointed and not articulate, dehiscing in a continuous line along the ventral suture; (leaves normally 3-foliate the lateral leaflets much smaller) 7. *D. gyrans*.

1. **D. Cephalotes**, Wall. ; Fl. Br. Ind. ii. 161 ; Gamble Man. Ind. Timb. 238 ; Brandis Ind. Trees 222 ; Vern. *Bhatta*, Garhwal.

A shrub 4-6 ft. high, with grey bark ; branches triquetrous. *Leaves* 3-foliate ; petiole 1-2 in. long, deeply furrowed, grey-downy. *Leaflets* 3·5-6 by 1·5-2·5 in., oblong or elliptic, subcoriaceous, grey-silky beneath ; lateral nerves and midrib prominent and brightly silky beneath, the former 10-16 pairs. *Flowers* about 3 in. long, 20 or more in dense axillary umbels ; pedicels silvery, jointed at the apex. *Calyx* 1·5 in. long ; teeth lanceolate. *Corolla* red, 2·5 in. long. *Pod* about 1 in. long, 4-5-jointed, indented more or less along both sutures, densely grey-silky.

Common in the Sál forests of the DÚN, especially at Lachi-wála and Tháno.

The pods are said to be poisonous for cattle.

Fl. July, Aug. Fr. Nov., Dec.

2. **D. pulchellum** Benth. ; Fl. Br. Ind. ii. 162 ; Brandis For. Flora 145, Ind. Trees 223 ; Gamble Man. Ind. Timb. 239. Vern. *Thapi*, Garhwal ; *jat Salpan*, Hind.

An erect shrub, 4-6 ft. high ; branches ribbed, grey-downy. *Leaves* 3-foliate ; petiole 3-5 in. long. *Lateral leaflets* 1·5-2·5 by 6-1 in., 5-8 in. below the *terminal* which is 2·5-4 by 1·2-1·5 in., both elliptic or oblong-lanceolate, generally acute, rounded at the base, pubescent beneath ; lateral nerves 8 pairs. *Flowers* 2-3 in. long, in 2-6-flowered umbels, each umbel subtended by a pair of persistent, orbicular, foliaceous bracts about 5 in. diam., the umbels themselves in axillary and terminal plicate racemes, 4-10 in. long. *Calyx* 1 in. long ; teeth shorter than the tube. *Corolla* 2·5 in., white with a shade of red. *Pod* 2·5 in. long, generally with 2 joints, constricted at both sutures.

Common in the DÚN in the same localities as the preceding species.

Fl. July-Sept. Fr. Cold season.

3. **D. laburnifolium** DC. ; Fl. Br. Ind. ii. 163.

A shrub 6-8 ft. high ; branches few, slender, glabrescent ; bark dark-grey. *Leaves* 3-foliate ; petiole 1-1·5 in., thickened,

grooved; stipules free, minute. *Leaflets* 2-4 by 1-1.5 in., oblong-lanceolate, acute at both ends, dark-green, glabrous and shining above, hairy on the nerves beneath. *Racemes* about 6 in. long; pedicels .2-.3 in. *Flowers* whitish, .3-.4 in. long. *Calyx* about a third of the flower, hairy; teeth narrow, as long as the tube. *Corolla* .2-.3 in. *Pod* 2-4 in. by about .2 in., beset with short hooked hairs; joints 6-8, rectangular, twice as long as broad, easily breaking off.

In damp shady localities in the DŪN, such as Mothronwála. Nakraunda, Jōgiwála, Khairi, Robbers' Cave, etc.

The leaves are eaten by buffaloes.

Fl. July, Aug. Fr. Dec., Jan.

4. ***D. pseudo-triquetrum***, DC.; Syn.—*D. triquetrum*, Fl. Br. Ind. ii. 163 (in part); Brandis For. Flora 146, Ind. Trees 224.

A sub-procumbent shrub, 3-4 ft. long; branches triquetrous, glabrescent. *Leaves* 1-foliate. *Leaflets* 3-6 by 1.2-2.2 in., oblong, lanceolate, acute, subcoriaceous, scaberulous above, hairy on the nerves beneath; petiole .7-1.3 in. long, winged to an oblanceolate shape, .2-.4 in. broad: main lateral nerves 12-15 pairs. *Racemes* 6-12 in. long, axillary and terminal; pedicels .1-.2 in. *Calyx* about .1 in., campanulate. *Pod* 1-2 by .2 in., 6-8-jointed, glabrous or pubescent, indented between the joints at the ventral suture.

Common about Lachiwála on forest-paths, in grass-lands, and along the banks of the Ré-nadi in the DŪN.

Fl. July, Aug. Fr. Sept.-Dec.

5. ***D. tiliaefolium***, G. Don; Fl. Br. Ind. ii. 168; Brandis For. Flora 145, Ind. Trees 223; Gamble Man. Ind. Timb. 239. Vern. *Mártói*, *Mátói*, Jaunsar.

A somewhat diffuse shrub, 4-10 ft. high; branchlets pubescent. *Leaves* 3-foliate; rachis 1.5-3.5 in. long, pubescent. *Leaflets* 1-3 by .7-2.2 in., broad-ovate or rhomboid, often mucronate at the apex, subcoriaceous, glabrescent above, silky-pubescent beneath, margins entire or wavy; main lateral nerves about 6 pairs, the lowest pair from near the base. *Flowers* pale lilac in terminal panicles and axillary racemes; pedicels .3-.4 in. long, filiform, finely downy. *Calyx* .1 in., downy; teeth shorter than the tube. *Corolla* .3-.5 in. long. *Pod* 2-3 by .25 in., slightly falcate, compressed, indented between the joints at the inner edge, thinly silky-hairy; joints 6-9, longer than broad.

Common and somewhat gregarious in JAUNSAR and TEHR GARHWAL, between 4,000 and 8,500 ft.

D. serriferum, Wall.; a form with narrower acuminate leaflets is also found within the area—Kathian; Mussoorie; Phedi, etc.

The thin grey bark is used for rope and paper-making. The twigs are browsed by cattle and the branches are cut up into faggots and used for fuel in Chakrata.

Fl. June, July. Fr. Oct., Nov.

6. ***D. latifolium***, DC.; Fl. Br. Ind. ii. 168; Brandis For. Flora 145, Ind. Trees 224.

An erect undershrub, 4-6 ft. high. *Leaves* 1-foliolate. *Leaflet* 2-5 by 1-5-3-5 in., broad-ovate, truncate or cordate and 3-nerved at the base, hispid above, densely soft-pubescent beneath; tip rounded or acute, mucronate; lateral nerves 7-8 pairs including the basal; petiole 4-7 in. long; stipules semicordate, cuspidate. *Flowers* 2 in. long, bright-purple, clustered on axillary and terminal racemes which are 4-8 in. long. *Calyx* minute; teeth linear. *Pod* 6-1 by about 1 in., 4-6-jointed, much constricted between the joints, densely clothed with minute hooked hairs; joints 4-6, rather longer than broad, readily separating.

The DŪN and the OUTER HIMALAYA, up to 3,500 ft.

Fl. Aug., Sept. Fr. Nov., Dec.

7. ***D. gyrans***, DC.; Fl. Br. Ind. ii. 174; Brandis For. Flora 146; Gamble Man. Ind. Timb. 238. The Telegraph plant. Vern. *Khūni*, Garhwal.

An erect shrub, 4-7 ft. high, with glabrous green branches. *Leaves* normally 3-foliolate, but often 1-foliolate by the abortion or early fall of the small lateral leaflets; petiole 1-1-5 in. *Terminal leaflet* 3-4 by 1-1-7 in., oblong-lanceolate, quite entire, rather membranous, glaucous beneath, often with irregular-shaped glaucous blotches above; main lateral nerves about 10 pairs. *Lateral leaflets* absent or rudimentary, 5-7 by 1-1-12 in., rotating by jerks. *Flowers* 3-4 in. long, in axillary racemes and terminal panicles, at first hidden by large ovate bracts; pedicels 25 in. long, downy. *Calyx* 1 in. long, campanulate; teeth short. *Corolla* 3-4 in. long. *Pod* 1-1-5 by 2 in., falcate, glabrescent, 6-10-jointed, not articulate, slightly indented along the lower, and dehiscing in a continuous line along the upper suture.

Common in the DŪN and in *Chir* forests along the TONS VALLEY, usually with grass.

Fl. Aug., Sept. Fr. Nov., Jan.

8. ***D. gangeticum***, DC.; Fl. Br. Ind. ii. 168; Brandis Ind. Trees 224. Vern. *Shalparni*, *Salpani*.

An erect or suberect undershrub 2-4 ft. high, branches adpressed hairy. *Leaves* 1-foliate; *leaflets* 3-6 in. long, variable in width, ovate-oblong, acute, membranous, glabrescent above, glaucescent and finely silky beneath, base rounded or subcordate; *petiole* .5-1.2 in. long; *stipules* .25-.4 in. long, persistent. *Flowers* in numerous close-set fascicles, arranged in slender terminal and axillary racemes 6-12 in. long; *pedicels* about .15 in. long, puberulous. *Corolla* about .15 in. long, white or tinged with purple. *Pod* .5-.8 in. long by .1 in. broad, often falcate, 6-8 jointed; joints minutely hairy.

Common in blanks in Sál forests in the Dun.

Fl. June-Aug. Fr. Cold season.

The plant is used medicinally.

9. **D. polycarpum**, DC.; Fl. Br. Ind. ii. 171; Brandis Ind. Trees 223.

A small suberect hairy undershrub; *twigs* striate, woody. *Leaves* 3-foliate; *leaflets* .5-1.5 in. long, broadly ovate, entire, rounded at both ends, dark-green and glabrous above, glaucous and adpressed silky-hairy beneath. *Flowers* purple, .2-in. long, in dense axillary racemes up to 3 in. in length. *Pods* sessile, .5-.8 in. long, upper margin straight, lower indented; *joints* 5-7, clothed especially on the sutures with minutely hooked hairs.

Dehra Dun and outer Himalaya up to 5,000 ft.; Nakund; Ramgarh, etc.

Fl. July-Aug.

10. **D. parvifolium**, DC.; Fl. Br. Ind. ii. 174.

A diffuse undershrub; stems tufted much branched, pubescent when young. *Leaves* 3-foliate; *leaflets* .2-.5 in. long, ovate or oblong-ovate, entire, obtuse or subacute, mucronate, glabrous above, pubescent beneath; *stipules* about as long as the petioles, linear-setaceous, persistent. *Flowers* purple, about .15 in. long, in terminal 6-8-flowered racemes, longer than the leaves. *Calyx* hairy, teeth acuminate. *Pod* sessile, about .5 in. long, deeply indented on both sutures, 3-5-jointed; joints suborbicular, minutely pubescent.

Common in the Dun, ascending to 6,000 ft. in the hills, e.g., Mussoorie; Landour, Asarori, etc.

Fl. Rainy season.

11. **D. podocarpum**, DC.; Fl. Br. Ind. ii. 165.

An erect undershrub 2-4 ft. high. *Leaves* 3-foliate; *petiole* up to 3 in. long; *leaflets* broadly obovate, entire, usually acute at

the apex, cuneate at the base, thin, membranous, dark-green above glaucous beneath; terminal leaflet 1·5-3 in. long. *Flowers* pink, 1·5 in. long, in axillary racemes about 1 ft. long, *Pod* 1·5 in. long, stalked, upper margin straight, lower deeply indented, 1-2-jointed.

Mussoorie and Tehri-Garhwal ascending to 7,500 ft.: Phedi, etc.

Fl. Rainy season.

12. **D. sambuense**, DC.; Brandis Ind. Trees 223; Syn. *D. floribundum*, G. Don; Fl. Br. Ind. ii. 267. Vern. *Gor Martoi*: Jaunsar.

An erect deciduous shrub; twigs angular, silky pubescent. *Leaves* 3-foliolate; *leaflets* 1·5-3 in. long by 1-2 in. broad, ovate or obovate, entire, dark-green and glabrescent above, more or less densely silky-hairy beneath, usually rounded at both ends, often mucronate at the apex; lateral leaflets slightly oblique; *common petiole* 1-2·5 in. long; stalk of terminal leaflet 1·3-1·5 in. long, of the lateral 1 in. long; *stipules* 1·3 in. long, lanceolate, long-pointed, striate, persistent. *Flowers* lilac, 1·35-1·4 in. long, in axillary and terminal usually branched racemes; *pedicels* 1·5-1·2 in. long, slender. *Calyx* 1·2 in. long, thinly silky, teeth about as long as the tube. *Pod* sessile, 1·7-1 in. long, by 1 in. broad, upper margin slightly lower, deeply indented, densely brown adpressed hairy, joints 4-8.

Common near Mussoorie; also in Jaunsar and Tehri-Garhwal, e.g., Chakrata, etc.

Fl. July-Aug.

13. **D. concinnum**, DC.; Fl. Br. Ind. ii. 170; Brandis Ind. Trees 223.

A tall undershrub with slender, drooping branches. *Leaves* 3-foliolate, one or both the lateral leaflets sometimes wanting; *leaflets* 1·5-3 in. long by 1·6-1·25 in. broad, elliptic-oblong, entire, rounded at both ends, often mucronate, finely adpressed hairy on both surfaces, pale and glaucescent beneath; lateral leaflets smaller; *common petiole* up to 1 in. long; stalk of the terminal leaflets up to 1·3 in. long, of the lateral leaflets up to 1 in. long; *stipules* 1·3-1·5 in. long, persistent. *Flowers* deep purple or bluish, 1·2-1·3 in. long, in slender axillary and terminal drooping racemes 6-12 in. long; *pedicels* usually in pairs, slender, 1·2-1·4 in. long; *bracts* 1·3 in. long, lanceolate, acuminate, closely imbricate, caducous. *Pod* 1·5-1·75 in. long by about 1 in. broad, distinctly stalked, curved, upper suture nearly straight, lower deeply indented, joints 3-6, minutely hairy.

Dehra Dun, ascending in the hills to 6,000 ft., e.g., Sainjni. Dharmigadh; Mussoorie, etc.

Fl. Aug.-Sept.

14. **D. laxiflorum**, DC.; Fl. Br. Ind. ii. 164; Brandis Ind. Trees 223.

An erect undershrub 2-3 ft. high, branchlets hairy when young. *Leaves* 3-foliate; *leaflets* 3-6 in. long by 1.5-2.5 in. broad ovate, elliptic or ovate-lanceolate, acute, membranous, green and thinly hairy above when young, glabrescent when mature, glaucous beneath with fine adpressed hairs and prominent nerves; lateral leaflets smaller, slightly oblique; *common petiole* 1-2.3 in. long; stalk of terminal leaflet .5-1 in. long, of the lateral leaflets .1 in. long; *stipules* .3-.5 in. long, lanceolate, acuminate. *Flowers* .2-.25 in. long, in slender drooping, axillary and terminal racemes 6-12 in. long; *pedicels* slender, .16-.25 in. long, usually clustered; *bracts* minute, deciduous. *Calyx* .1 in. long, densely hairy, teeth longer than the tube; *corolla* pale-yellow, the wings and keel tinged with blue. *Pod* 1-1.5 in. long by .1 in. broad, clothed with minute, hooked hairs, both sutures slightly undulate; joints 4-10, flattened, 2-3 times as long as broad.

Common in the Dun, ascending to 6,000 ft. in the hills, e.g., Raipur; Rajpore; Mussoorie, etc.

Fl. Aug.-Sept. Fr. Nov.-Dec.

12. **Abrus**, Linn.

1. **A. precatorius**, Linn.; Fl. Br. Ind. ii. 175; Brandis For. Flora 139, Ind. Trees 225; Gamble Man. Ind. Timb. 240. Vern. *Chāntli*, *Ratti*, Dún; *Gúnjá*, *Gúnchi*, Hind.

A much-branched climber with a woody stem. *Leaves* paripinnate, 2-3 in. long. *Leaflets* 20-40, opposite, deciduous, .4-1 by .2-.3 in., oblong-ligulate, membranous, glabrous or thinly silky beneath. *Flowers* reddish or white, in dense pedunculate racemes which are shorter than, or as long as, the leaves; peduncles often leaf-bearing. *Calyx* 1-1.5 in. long, campanulate, truncate, thinly silky. *Corolla* .3-.5 in. long; standard ovate, acute; wings narrow; keel larger than the wings, arcuate. *Stamens* 9, united in a sheath which is slit above; the tenth absent. *Ovary* many-ovuled; style short, incurved, not bearded; stigma capitate. *Pod* 1-1.7 by .4-.5 in., oblong, turgid, 3-5 seeded. *Seeds* about .2 in. long, ovoid or subglobose, generally two-thirds scarlet or white and the rest jet-black, with a large white hilum in the black part, sometimes wholly black or white, smooth, shining.

Very common along the foot of the SAHÁRANPUR SIWALIKS, especially near Khárá, Ránipur and Kasúmri; also on hedges in the DÚN; Amláwa Valley, JAUNSAK.

The seeds are recognized by Indian jewellers as the minimum unit of weight, and are used for weighing gold and precious stones. The root resembles liquorice in medicinal property.

Fl. Aug., Sept. Fr. Cold season.

A. pulchellus, Wall., Fl. Br. Ind. ii. 175—differs from the above in having larger leaflets, racemes exceeding the leaves, larger but thinner-valved pod and greyish-brown compressed seeds. Found in the DUN (Lachiwála, Tháno, Raipur, etc.) and the OUTER HIMALAYA. Fl. Aug., Sept.

13. *Mucuna*, Adans.

Climbers, generally herbaceous. *Leaves* large, pinnately 3-foliolate, stipellate. *Flowers* large, usually dark-purple, in few-flowered racemes or corymbs. *Calyx* campanulate, the two upper teeth connate. *Corolla* much exserted; keel rostrate, much exceeding the standard and usually slightly exceeding the wings. *Stamens* 2-adelphous; anthers alternately versatile and basifixed. *Ovary* sessile, many-ovuled; style incurved, beardless; stigma capitate. *Pod* hard, usually covered with irritating bristles.

Analysis of the Species.

A woody climber; pod obliquely plaited
on the faces 1. *M. imbricata*.

A herbaceous climber; pod not plaited on
the faces 2 *M. prurita*.

1. *M. imbricata*, DC.; Fl. Br. Ind. ii. 185; Brandis Ind. Trees 225; Gamble Man. Ind. Timb. 240.

A large woody climber with slender, glabrescent hollow branches. *Leaflets* 5-7 in. long, elliptic or ovate-oblong, caudate acuminate, membranous, sparsely adpressed hairy below, nearly glabrous above; *lateral leaflets* smaller, oblique, broader than the terminal; *stipules* linear, .3 in. long; *stipels* setaceous, .15 in. long. *Racemes* usually axillary, laxly few-flowered, on long, slender pendulous peduncles up to 12 in. or more in length; *pedicels* .5 in. long, in the axils of large, roundish, imbricating concave, deciduous

bracts, 1-3 flowered. *Calyx* .7-1 in. long, velvety and with a few scattered brown bristles; teeth nearly as long as the tube. *Corolla* 2-2.5 in. long, dull purple; standard about half as long as the abruptly inflexed keel; wings .5 in. broad, as long as the keel. *Pod* oblong, 4-6 in. long by about 2 in. broad, clothed with deciduous brownish-yellow irritating bristles, obliquely plaited on the faces and winged along both sutures, wings .25-.5 in. broad. *Seeds* usually 2-4, mottled with black.

Ravines near Dehra; Robber's Cave; etc.

Fl. Aug.-Sept. Fr. cold season.

2. ***M. prurita***, Hook; Syn.-*M. pruriens*; Fl. Br. Ind. ii. 187 (not of DC.); Gamble Man. Ind. Timb. 240; Brandis Ind. Trees 226. The Cowitch or Cowhage plant. Vern. *Káunch*, *Gáunch*, DŪN.

An annual twining herb. *Leaflets* 3-8 in. long, ovate or rhomboid, membranous, glabrescent above, adpressedly silky pubescent beneath, mucronate; rachis 6-10 in. long. *Racemes* 4-8 in. long, short-peduncled, drooping, 10-20 flowered. *Calyx* .25-.4 in. long, 2-lipped, with a few irritating bristles. *Corolla* 1.3-1.6 in. long, purplish. *Pod* 2-3 by .6-.8 in., 5-6-seeded, turgid turned up at the end, longitudinally ribbed, covered with dense pale-brown bristles.

On hedges in the outskirts of villages and in abandoned village sites in SAHÁRANPUR and the DŪN. Fairly common.

The seeds and roots are used in medicine and the irritating hairs as a vermifuge.

Fl. Feb., Mar.

M. capitata, W. & A., Fl. Br. Ind. ii. 187,—is closely allied to the last species, but the flowers are corymbose, and the pod about twice as long and covered with deciduous bristles. Found in the SAHÁRANPUR SIWALIKS. There are no specimens in Herb. Dehra from this area.

Fl. Rainy season. Fr. Cold season.

14. ***Erythrina***, Linn.

1. ***E. suberosa***, Roxb.; Fl. Br. Ind. ii. 189; Brandis For. Flora 140, Ind. Trees 227; Gamble Man. Ind. Timb. 241. Vern. *Dhaul Dhák*, *Madár*, Hind.

A moderate-sized deciduous tree; outer bark corky, light-grey, 1-2 in. thick, with deep irregular vertical cracks; branches armed with straight whitish conical prickles; young parts, leaves

beneath and inflorescence usually covered with soft tomentum. *Leaves* pinnately 3-foliolate; stipels glanduliform. *Leaflets* 3-8 in. broad, often broader than long, rhomboid, green and glabrous above, matted with cottony down beneath. *Racemes* 9-15 in. long, crowded at the ends of the branches. *Flowers* bright-scarlet, 1-5-2 in. long, in fascicles of 2-3; pedicels .3-.5 in. long. *Calyx* campanulate, obsoletely 2-lipped in flower. *Corolla* much exerted, straight; standard 1-5-2 in. long, .5-.7 in. broad, narrowed into a short claw; wings .2-.3 in. long, falcate; keel-petals .6-.8 in. long, connate. *Stamens* 2-adelphous; upper stamen free nearly to the base. *Ovary* stipitate, many-ovuled; style incurved, beardless; stigma capitate. *Pod* stipitate, 3-4 by .3-4 in., tapering at both ends, torulose, 4-6-seeded; seeds black.

Var. *glabrescens*, Prain, Journ. As. Soc. Beng. lxvi, Part ii. No. 2. 410; Syn.—*E. glabrescens*, Parker, Ind. For. xlvii (1920), 647—differs from the type in that the leaflets are glabrescent beneath at an early age, afterwards glaucous; bark nearly smooth.

The type is occasionally met with along ráus in the SIWALIKS, but the above variety is common in the Sál forests of the SIWALIK DIVISION, and also in the Tons and Jumna Valleys in JAUNSAIR and TEHRI-GARHWAL, up to 4,000 ft.

Wood soft, white, spongy, but fibrous and tough, very light weighing 13-20 lbs. per c.ft. It is used for scabbards, ladles, sieve-frames, and butter and ghee-pots. The tree is easily propagated by cuttings.

Leafless Jan., Feb. Fl. Mar., Apr. Fr. June.

E. Blakei, Hort.—A large shrub or small tree with spreading branches and smooth grey bark with few prickles and long racemes of dark scarlet flowers, is occasionally cultivated in gardens. It produces no seed and is apparently a hybrid.

15. *Spatholobus*, Hassk.

1. *S. Roxburghii*, Benth.; Fl. Br. Ind. ii. 193; Brandis For. Flora 143, Ind. Trees 229; Gamble Man. Ind. Timb. 243. Vern. *Maulá* or *Malhá-bel*, Dún.

A large sinistrorse climber; branches grey-pubescent; stem with concentric layers of bast inside, which exude a red gum when cut. *Leaves* pinnately 3-foliolate, stipellate; rachis 3-4 in. long. *Leaflets* 4-9 by 3-6 in., ovate or elliptic, acuminate, subcoriaceous, pubescent beneath, the lateral oblique; lateral nerves 6-8 pairs, irregularly branched; petiolules .1-.3 in. long. *Flowers* .3-.4 in. long, white or reddish, in fascicles of 3 on large terminal panicles

which are often 2-3 ft. long; pedicles very short. *Calyx* campanulate, grey-velvety, half the length of the flower; teeth acute, the two upper connate. *Standard* emarginate, longer than the keel, which is obtuse and nearly straight; wings free. *Stumens* diadelphous. *Ovary* shortly stipitate, 2-ovuled; style incurved beardless; stigma capitate. *Pod* 3-5.5 by 1-1.3 in., suddenly narrowed into a stalk .4-.6 in. long, softly brown-velvety, with only one seed near the end, dehiscing from the apex only down to the seed.

Common in the Sál forests of the SIWALIK DIVISION, especially in the Siwalik Range, where it does considerable harm to all trees by bending and distorting their stems, round which it twines with a very tight grip. In this respect it is the worst of all harmful climbers.

Wood soft and porous, but burns slowly and keeps on fire for a long time, for which purpose it is often used by people living near forests.

Fl. Sept.-Dec. Fr. Feb.-Apr.

16. *Butea*, Roxb.

1. *B. frondosa*, Koenig; Fl. Br. Ind. ii. 194; Brandis For. Flora 142, Ind. Trees 230; Gamble Man. Ind. Timb. 243. Vern. *Dhák*, *Palás*, Hind.

A moderate-sized deciduous tree; bark fibrous, bluish-grey or light-brown outside, exuding a red juice when cut. *Leaves* pinnately 3-foliate, stipellate; rachis 5-9 in. long; stipules and stipels tomentose, deciduous. *Leaflets* hard, rigidly coriaceous, glabrescent above, silky-tomentose beneath; lateral leaflets 6-8 by 5-7.5 in., obliquely ovate or broad elliptic; petiolules .3-.4 in. long, stout; terminal 5-8 by 4.5-7 in., rhomboid or broadly obovate from a cuneate base; lateral nerves 4-6 pairs, prominent. *Flowers* 2-3.5 in. long, fascicled on rigid axillary and terminal racemes which are 4-7 in. long; inflorescence, bracts and calyx dark brown-velvety. *Calyx* .5 in. long, fleshy, grey-silky inside. *Petals* bright orange-red, equal, silvery-tomentose outside; standard 1 in. broad, recurved; keel incurved, beaked; wings falcate, adhering to the keel. *Stumens* 2-adelphous. *Ovary* shortly stalked, 4-ovuled; style filiform, curved, not bearded; stigma capitate. *Pod* 4-6 by 1.5-2 in., ligulate, firm, pendulous, silky-tomentose, abruptly narrowed to a stalk .5-.7 in. long, with only one seed near the apex, indehiscent below the seed.

Common in the DÚN and SAHÁRANPUR FORESTS in blank, and open places, especially on water-logged soils, as at Pathri. It is the most common indigenous tree of the UPPER GANGETIC PLAIN.

Wood dirty-white, porous, soft; annual rings indistinct; weight about 36 lbs. per c.ft. It is durable under water, and is used for well-curbs and piles. The bark of the roots yields a coarse brown fibre used for rough cordage and for caulking boats on the Ganges. The red juice exuded by the bark hardens into beads of ruby-coloured gum similar to *kino*, and is used as a substitute for it. The flowers give an orange dye, and a decoction of them is used to keep out white-ants from fields. The seeds have a medicinal use. Lac is often collected on the branches. The leaves are used as plates and to wrap up parcels, and are also lopped for buffalo fodder.

Leafless in March. New leaves and fl. Apr., May. Fr June, July.

17. *Pueraria*, DC.

1. *P. tuberosa*. DC.; Fl. Br. Ind. ii. 197; Brandis For. Flora 141, Ind. Trees 228; Gamble Man. Ind. Timb. 245. Vern *Sural, Saral, Sarār, Dūn* and *Sahāranpur*.

A twining shrub with stringy grey bark; young branches grey-pubescent; stem porous, producing large globose underground tubers which are often of immense size,—whence the specific name. *Leaves* pinnately 3-foliate, stipellate; rachis 5-8 in. long. *Leaflets* 4-6 by 3-4 in., broad-ovate, acuminate, silky-pubescent when young, glabrescent above and thinly pubescent beneath when mature, the lateral oblique; main lateral nerves 6-8 pairs including the stronger basal pair; base truncate or subacute, 3-5-nerved; lateral petiolules .2-.3 in. long. *Flowers* bright blue, in simple or paniced terminal racemes, 6-12 in. long; bracts minute. *Calyx* about .2 in. long, densely silky; teeth shorter than the tube. *Corolla* about .4 in. long; standard spurred at the base; wings oblong-falcate; keel obtuse, nearly straight. *Stamens* usually monadelphous or the vexillary stamen often quite free. *Ovary* sessile, many-ovuled; style filiform, much incurved, beardless; stigma capitate. *Pod* 2-3 in. long, flat, flexible, 3-6-seeded, contracted between the joints, clothed with long bristle-like brown hairs.

Remarkably common about Kālsi; also found throughout the DŪN and SAHĀRANPUR FORESTS, especially on *Zizyphus Jujuba* near Shāhjahānpur.

The large tubers which are sometimes up to 18 in. in length and 12 in. in diameter, have a liquorice taste, and are eaten and used in medicine.

Leafless Nov.-May. Fl. Mar., Apr. Fr. Nov., Dec.

18. *Atylosia*, W. & A.

Erect or twining herbs or shrubs. *Leaves* 3-foliate, lower surface more or less covered with minute resinous dots. *Flowers* yellow, in axillary racemes or clusters. *Calyx-tube* short; teeth 5, nearly equal, the 2 upper partially united, the lowest, the longest. *Corolla* exserted; standard orbicular spreading; keel obtuse, slightly incurved. *Stamens* diadelphous; *anthers* uniform. *Ovary* sessile, 3-many-ovuled; *style* incurved, glabrous; *stigma* small, capitate. *Pod* oblong, somewhat flattened, marked with transverse parallel grooves between the seeds, which have a conspicuous, divided strophiole.

Analysis of the Species.

Flowers .75-1.25 in. long; petals marcescent.

Leaves not reticulate beneath; end leaflet longer than broad 1. *A. mollis*.

Leaves strongly reticulate beneath; end leaflet as broad as long or nearly so 2. *A. crassa*.

Flowers not more than .4 in. long; petals deciduous 3. *A. scarabæoides*.

1. ***A. mollis***, Benth.; Fl. Br. Ind. ii. 213. Vern. *Ban Sem* (Garhwal).

A middle-sized twining shrub; young parts, inflorescence and leaves beneath densely grey-tomentose. *Leaves* 3-foliate; *leaflets* 1.5-2.5 in. long, rhomboid, cuspidate, stipellate, 3-nerved at the base, the end-leaflet much longer than broad, the lateral leaflets very oblique; reticulation not prominent beneath. *Flowers* yellow, about 1 in. long, in axillary racemes. *Calyx* grey-downy, about half the length of the flower. *Pod* about 2 in. long by .3 in. broad, with transverse depressions between the seeds, grey-pubescent. *Seeds* 8-10.

Common throughout the Dûn and Outer Himalaya, and also along the foot of the Sahâranpur Siwaliks.

Fl. Dec., Jan. Fr. Mar., April.

A. crassa, Prain.; Jour. As. Soc. Beng. lxvi, part 2, 432.
A. mollis, Benth. (in part); Fl. Br. Ind. ii. 213. Vern. *Ban taur*.

A suffruticose climber with slender, tawny-tomentose stems. *Leaves* 3-foliolate, sparsely brown-pubescent and strongly reticulate beneath; *leaflets* 2-3 in. long, rhomboid, cuspidate acuminate at the apex, narrowed to a rounded base; end leaflet about as broad as long, the lateral very oblique. *Racemes* short-peduncled, axillary and panicle, up to 4 in. long; *pedicels* germinate; *bracteoles* large, roundish, acute. *Calyx* finely downy, .3 in. long. *Corolla* yellow, .75 in. long. *Pod* 1-1.25 in. long, by about .6 in. broad; viscid pubescent, with transverse oblique depressions between the seeds.

Dehra Dun and Outer Himalaya in similar localities as the previous species. Paundha; Kalsi; etc.

Fl. Dec., Jan. Fr. Mar., April.

A. scarabæoides, Benth.; Fl. Br. Ind. ii. 215.

A slender twiner, sometimes with a short woody basal portion; stems densely grey-pubescent. *Leaves* 3-foliolate, 1.5-2 in. long; *leaflets* obovate-oblong or elliptic, obtuse or subacute, subcoriaceous, 3-nerved at the base, thinly grey-pubescent above, densely downy beneath, the lateral leaflets oblique; stipels 0. *Flowers* 2-6, on a short densely pubescent axillary peduncle; *pedicels* .2 in. long. *Calyx* densely silky, about .2 in. long; teeth linear, the lowest twice as long as the tube. *Corolla* yellow, .3-4 in. long. *Pod* .75-1 in. long, straight, densely hairy; *seeds* 4-6.

Dehra Dun and the Siwalik Tract, chiefly in rau-beds—Bihari-garh; Dehra Dun; Barkala; etc.

Fl. most part of the year.

19. *Rhynchosia*, Lour.

1. **R. Pseudo-cajan**, Camb.; Fl. Br. Ind. ii. 223; Brandis Ind. Trees 707; Gamble Man. Ind. Timb. 264.

An erect shrub, 4-6 ft. high; branches longitudinally ribbed; grey-tomentose. *Leaves* pinnately 3-foliolate, gland-dotted beneath; rachis .5-1 in.; stipules minute. *Leaflets* .5-2 by .3-1.5 in., ovate to rhomboid, very softly woolly-tomentose and reticulate beneath, strongly 3-nerved at the base; stipels 0. *Flowers* in short-peduncled compact corymbs; pedicels short. *Calyx* .2 in. long; teeth narrow-acuminate, densely woolly. *Corolla* .4-6 in. long, pale-yellow; keel incurved. *Stamens* 2-adelphous. *Ovary* sessile, usually 2-ovuled; style long, much incurved; stigma capitate. *Pod* 1 by .4 in., oblong, straight, slightly compressed, 1-2-seeded, persistently grey woolly.

Fairly common in fire-traces and grass-lands in the Tons Valley and elsewhere in JAUNSAIR and TEHRI-GARHWAL, up to 7,000 ft. Also at higher elevations in the SIWALIKS.

Fl. and fr. Apr.-June.

20. *Flemingia*, Roxb.

Generally moderate-sized shrubs. *Leaves* digitately 3-foliolate or simple, gland-dotted beneath. *Flowers* generally in cymes. *Calyx-tube* short; teeth narrow, the lowest often the longest. *Corolla* scarcely exerted; petals equal. *Stamens* 2-adelphous. *Ovary* subsessile, 2-ovuled; style filiform, beardless; stigma capitate. *Pod* small, inflated, usually 2-seeded.

Analysis of the Species.

A. Leaves simple; bracts persistent, folding (hiding the flowers).

Leaves oblong-lanceolate, rounded at the base 1. *F. bracteata*.

Leaves orbicular, cordate 2. *F. Chappar*

B. Leaves digitately 3-foliolate; bracts caducous, not folding.

Branches triquetrous; bracts linear, exceeding the flowers 3. *F. stricta*.

Branches scarcely angled; bracts lanceolate, shorter than the flowers.

Racemes condensed, shorter than the petioles 4. *F. congesta*.

Racemes elongated, exceeding the petioles 5. *F. semialata*.

1. *F. bracteata*, Wight.; Syn.—*F. strobilifera* var. *bracteata*, Baker.—Fl. Br. Ind. ii. 227; Brandis For. Flora 143, Ind. Trees 231; Gamble Man. Ind. Timb. 246.

An undershrub, usually about 5 ft. high; branches terete, velvety. *Leaves* simple, 3-6 by 1-1.8 in., oblong-lanceolate, sub-acute, rounded at the base, subcoriaceous, glabrescent above, thinly silky-pubescent beneath; petiole .2-.7 in. long; stipules linear, scarious, .2-.4 in. long. *Racemes* 3-6 in. long; rachis zigzag, downy; bracts .5-1 in. long, rather broader than long, deeply cordate, membranous, reticulate, downy, folded. *Flowers* .2-3 in. long; calyx hairy; corolla purple, little exserted. *Pod* .3-.4 in. long, 2-seeded, downy.

Very common in blanks in Sál forests in the DEHRA DUN AND SAHARANPUR DIVISIONS, also in the HILLS, up to 3,000 ft.

The leaves are used for thatching.

Fl. Aug.-Nov. Fr. Cold season.

Very similar in appearance is *F. paniculata* Wall.; Fl. Br. Ind. ii. 227, but with paniced racemes, naked flowers and larger pods. Common near Lachiwála in the Dún. Fl. and fr. Mar.-May.

2. **F. Chappar**, Ham.; Fl. Br. Ind. ii. 227; Brandis For. Flora 143, Ind. Trees 231; Gamble Man. Ind. Timb. 246. Vern. *Sálpán* Hind.; *Chhánchra*, E. Dún.

A gregarious undershrub often up to 7 ft. in height. *Leaves* simple, 2.5-4 in. diam., orbicular, cordate, acuminate, glabrescent above, more or less pubescent beneath, especially along the nerves, 3-nerved at the base; lateral nerves 6-8 pairs above the basal; petiole .6-1.5 in. long. *Racemes* often paniced; rachis woody, pubescent; bracts 1 by 1.5 in., cordate, deeply emarginate, membranous, reticulate, folded, salmon-brown when mature. *Flowers* 3-.4 in.; corolla about half-exserted. *Pod* .3-.4 in. long, 2-seeded, downy.

Characteristic of the moister localities in Dún, e.g., Káluwála, Lachiwála, Tirsál, Kánsrao, Motichúr, etc.

The roots are used in Hindu medicine.

Fl. Aug.-Oct. Fr. Cold season.

3. **F. stricta**, Roxb. Fl. Br. Ind. ii. 228; Brandis Ind. Trees 232; Gamble Man. Ind. Timb. 246. Vern. *Bebar*, Garh.

A tall shrub, 6-10 ft. high; branches triquetrous, hairy. *Leaves* digitately 3-foliolate; petiole 4.5-5 in. long, 3-quetrous, furrowed; stipules 2 in. long, striate, caducous. *Leaflets* 6-12 by 2.5-4 in., oblong, narrowed at both ends, quite glabrous above, thinly hairy along the nerves beneath, very shortly petioluled, 3-5-nerved at the base; lateral nerves 12-16 pairs; glandular dots few,

minute, black. *Racemes* 3-4 in. long, dense-flowered; bracts .6-1 in., linear subulate, scariose, rigid; pedicels very short. *Flowers* .3-.5 in. long; calyx-teeth linear, the lowest much longer than the others; corolla as long as the lowest tooth. *Pod* .5 in long, glabrescent.

Common at Karwápáni in the Dún, and also in low valleys in the HILLS.

Fl. March, April. Fr. Aug., Sept.

4. ***F. congesta***, Roxb.; Fl. Br. Ind. ii. 228; Brandis For. Flora 143, Ind. Trees 232; Gamble Man. Ind. Timb. 246. Vern. *Banchhūi*, Dún.

An erect undershrub, 4-6 ft. high; branches slightly ribbed. *Leaves* digitately 3-foliolate; petiole 2.5-4 in. long, flattened; stipules .5 in. long, linear, caducous. *Leaflets* 4-6 by 2-3 in., ovate or oblong-lanceolate, glabrous above but pubescent and with brown or ruby-coloured glandular dots and hairy along the nerves beneath; the lateral oblique; base strongly 3-nerved; main lateral nerves about 6 pairs above the basal. *Racemes* dense, 1-2 in. long, sessile; bracts .12-.25 in. long, lanceolate, membranous, not rigid, grey-silky outside, deciduous; pedicels very short. *Flowers* about .5 in. long; calyx densely silky, teeth lanceolate; corolla scarcely exerted. *Pod* .3-.5 in. long, turgid, 2-seeded, obscurely downy, seeds .1 in. diam., shining, brown or blue black.

Very common in the Dún, especially in Sál forests—Lachiwála, Karwápáni, etc.

A dye may be obtained from the hairs of the pod.

Fl. April-Aug. Fr. Cold season.

5. ***F. semialata*** Roxb.; Prain in Journ. As. Soc. Beng. lxi, Part ii, No. 2, 439-441; Brandis For. Flora 143, Ind. Trees 232; Gamble Man. Ind. Timb. 246. Syn.—*F. congesta*, var. *semialata*, Fl. Br. Ind. ii. 229. Vern. *Bará Sálpán*, Hind.

A shrub closely resembling the last, but generally much taller, the *petiole* is shorter and narrowly winged towards the upper end, glandular dots often absent, the *racemes* longer (3-6 in.) and laxer and the *calyx-teeth* narrower.

As common as the last species, in much the same localities.

Fl. April-Aug. Fr. Cold season.

F. prostrata Roxb.; Prain in Journ. As. Soc. Beng. lxi, Part ii, No. 2, 440;—is simply a sub-erect form of *F. congesta* with tawny-pubescent inflorescence and narrower leaflets. Found near Lachiwála, Hardwar, etc.

21. *Dalbergia*, Linn. fil.

Trees, rarely climbing shrubs. *Leaves* imparipinnate; leaflets alternate, subcoriaceous, without stipels. *Flowers* small, in terminal or lateral panicles; bracts and bracteoles small. *Calyx* campanulate; teeth 5, short. *Corolla* exserted; standard broad; wings oblong; keel-petals shorter than the standard, connate at the tip. *Stamens* 9-10, diadelphous or monadelphous; anthers minute. *Ovary* stipitate, few-ovuled; style short, incurved, glabrous; stigma capitate. *Pod* thin, flat, coriaceous, 1-4 seeded, indehiscent.

Analysis of the Species.

Leaflets acuminate; stamens monadelphous 1. *D. Sissoo*.

Leaflets obtuse; stamens diadelphous.

Leaflets 11-15; panicles large, lax . 2. *D. lanceolaria*.

Leaflets 17-25; panicles small, compact . 3. *D. sericea*.

1. *D. Sissoo*, Roxb.; Fl. Br. Ind. ii. 231; Brandis For. Flora. 149, Ind. Trees 233; Gamble Man. Ind. Timb. 247. Vern. *Shisham*, *Sissú*, Hind.; *Táli*, Punjab. The Sissoo tree.

A fairly large tree; bark grey, somewhat reticulately longitudinally furrowed, exfoliating in narrow strips; young parts grey-downy. *Leaflets* 3-5, distinctly alternate, 1-2·5 in. diam., broad-ovate or rhomboid, tough, acuminate, glabrescent; lateral nerves very slender; rachis 2-4 in. long, zigzag, pubescent when young; petioles 1-2 in. long. *Flowers* 2-3 in. long, pale-white, in racemes 1-1·5 in. long, which are arranged in short axillary panicles. *Calyx* downy, about half the length of the flower. *Standard* with a long claw. *Stamens* 9, united in a sheath which is slit along the top. *Ovary* pubescent; style much shorter than the ovary; stigma large. *Pod* 2-3 by 3-5 in., strap-shaped, glabrous, pale-brown, a large proportion 1-seeded, narrowed at the base to a stipe 3-4 in. long. *Seeds* 2·5 in. long, kidney-shaped, flat.

Indigenous in the banks and beds of streams and on sandy soils in the DEHRA DŪN AND SAHARANPUR DIVISIONS, also in the Tons Valley, JAUNSEAR. Extensively planted in avenues and as a nurse and a fertiliser in tea-gardens in the DŪN.

The heartwood is brown, mottled with darker longitudinal veins, hard and close-grained; annual rings not distinctly marked; medullary rays very fine; pores uniformly distributed, joined by wavy white concentric bands; weight 45-55 lbs. per c.ft. "It is very elastic, seasons well, does not warp or split, and takes a fine polish."—*Sir D. Brandis*. It is highly esteemed for all purposes where strength and elasticity are required, its use being limited only by the supply. The twigs and leaves are lopped for fodder.

The tree can be easily raised from seed *e.g.*, Shāhdera and Changá Mangá plantations in the PUNJAB, and also from root-cuttings, *e.g.*, at Jeypore in RAJPUTĀNA.

Leafless Jan., Feb. New leaves Feb., Mar. Fl. Mar.-May, Fr. Nov.-Feb., remaining long on the tree.

Allied to the Sissu is *D. latifolia*, Roxb., Fl. Br. Ind. ii. 231; Brandis Ind. Trees 233, the Blackwood or Rosewood tree of S. India. Vern. *Walayti Shisham*, Hind. The bark is of a lighter colour and less furrowed, the leaflets thicker and emarginate, and the pod larger and firmer. The wood is even more valued than that of *Sissu*. It has a spreading crown with thick boughs and is often planted in avenues, *e.g.*, at Mâyāpur near Hardwar.

2. *D. lanceolaria*, Linn.; Fl. Br. Ind. ii. 235; Brandis For. Flora 151, Ind. Trees 236; Gamble Man. Ind. Timb. 253.

A large deciduous tree with glabrous branches; bark smooth, greenish-grey, yellow inside but instantly turning brown on exposure. Leaflets 11-15, 1-2 by .6-1.2 in., elliptic or oblong, acute or emarginate, subcoriaceous, pale beneath. Flowers 2-4 in. long, dull-white, in large lax terminal and axillary panicles. Calyx about .1 in. long, silky outside. Standard obovate, .25 in. broad, clawed, keel short. Stamens 10, equally diadelphous. Ovary 3-ovuled, hairy at the base. Pod 2-3 by .5-.7 in., narrowed at both ends, on a stipe .3-.5 in. long, glabrous, flexible, bright-brown, generally 1-seeded, reticulate over the seed.

Occasionally met with in the SIWALIK TRACTS and in valleys in the OUTER HILLS. Scarce. Chirak Block, along the Jhābri Sôt in the Mâyāpur Block. Rāiwāla in the DŪN, etc.

Wood white or yellow, moderately hard, not durable, no heartwood; weight 33-44 lbs. per c.ft.

Fl. May, June. Fr. Sept., Oct.

3. *D. sericea*, G. Don; Prain in Journ. As. Soc. Beng. Vol. 70, .51; Brandis Ind. Trees 237—Syn. *D. hircina*, Ham.; Fl. Br. Ind. ii. 236; Brandis For. Flora 151; Gamble Man. Ind. Timb. 255.

A small tree; young parts ferruginous-tomentose. *Leaves* 6-10 in. long. *Leaflets* 17-25, 1-1·5 by ·6-·9 in., ovate or elliptic, emarginate or rounded at the tip, rather membranous, clothed with very minute grey hairs. *Flowers* about ·25 in. long, in short congested axillary corymbose panicles, 1-2 in. long. *Calyx* about ·1 in. long, densely pubescent. *Standard* obovate, ·12 in. broad, gradually narrowed into a claw. *Stamens* 10, equally 2-adelphous. *Ovary* hairy. *Pod* 1-1·5 by ·2-·3 in., 1-3-seeded, but less frequently 1-seeded than in the last two species.

OUTER HIMALAYA, e.g., Málköt, Sahansra-dhárá, below Mussoorie, etc.; also in TEHRI-GARHWAL, up to 5,500 ft.

Fl. April, May. Fr. July, Aug.

22. *Sophora*, Linn.

1. *S. mollis*, Grah.; Fl. Br. Ind. ii. 251; Brandis For. Flora 132, Ind. Trees 244; Gamble Man. Ind. Timb. 264. Vern. *Sákiná*, Garhwal.—a name also applied to all shrubby *Indigoferas*, which it somewhat resembles in foliage.

A low shrub with grey-downy branches; bark dark-grey. *Leaves* imparipinnate, 4-6 in. long. *Leaflets* 21-35, ·5-1 in. long, elliptic, obtuse, emarginate, subcoriaceous, grey-green, finely grey-downy, prominently veined. *Racemes* 2-4 in. long, axillary, ascending. *Flowers* about 1 in. long, yellow, developed before the leaves. *Calyx* ·15-·2 in. long, oblique, grey-downy. *Corolla* ·6-·8 in. long; petals equal in length, clawed; standard broad. *Stamens* free; anthers versatile. *Ovary* stalked, many-ovuled; style incurved. *Pod* 3-4 in. long, 4-6 seeded, slightly pubescent when young, glabrous when mature, distantly moniliform; joints with 4 crustaceous wings, two along each suture; seeds brown, hard, shining.

Sahansra-dhárá and probably also in similar other localities in the OUTER HIMALAYA.

The wood is used for fuel, and the leaves and twigs for fodder. Fl. March, April when leafless. Fr. Rainy season.

The following plants of this SUB-ORDER deserve mention:—

1. *Eschynomene aspera* Linn.; Fl. Br. Ind. ii. 152; Brandis Ind. Trees 224. The Sola plant. Vern. *Sola*, Hind. *Stem* erect, full of white pith-like light wood, 5-6 ft. high, 1-1·5 in. diam. *Leaves*

imparipinnate; leaflets very small, numerous. *Flowers* yellow, about 7 in. long. *Pod* 2.2.5 by .3 in., long-stalked, with 3-6 separating joints. Found in swamps in the Pathri Forest. The so-called pith is made into hats and is used as floats by fishermen. Fl. Rainy season. Fr. Nov., Dec.

2. *Alysicarpus vaginalis*, DC.; Fl. Br. Ind. ii. 158. A little branched erect undershrub, 1.4 ft. high. *Leaves* simple or 3-foliate; leaflets .5-.2 in. long, broad or very narrow. *Calyx* about .12 in. long; corolla included. *Pod* .5-.7 in. long, terete; joints indehiscent. Found at Lachiwála in the Dún and similar other localities.

3. *Shuteria vestita*, W. & A.; Fl. Br. Ind. ii. 181. A slender climber with pinnately 3-foliate leaves; leaflets 1-2 in. long, obovate-oblong, glabrescent. *Flowers* reddish, .3-.4 in. long, in axillary racemes, 1-4 in. long. *Pod* 1-1.5 in., linear, flat, recurved, 5-6-seeded. Found near Dehra and in the HILLS, up to 6,000 ft.; Málköt, Korwá Forest, etc.

4. *Cajanus indicus*, Spreng.; Fl. Br. Ind. ii. 217. Ver. *Arhar*, *Tor*.

An erect shrub, 5-10 ft. high with silky sulcate branches. *Leaves* 3-foliate, gland-dotted beneath; leaflets upto 3 in. long, oblong-lanceolate, acute, entire, densely silky beneath. *Flowers* in loose corymbose racemes longer than the leaves, paniced towards the ends of branches. *Calyx* .25 in. long, gland-pubescent. *Corolla* 3 times as long as the calyx, yellow or (in *C. bicolor*) veined with red. *Stamens* diadelphous. *Pod* 2-3 in. long, brown-tomentose, topped with the persistent base of the style. *Seeds* about the size of a small pea, varying in colour from yellow and red to brown or black. Extensively cultivated within the area as a rainy season crop. The seeds are used as *dal*. The leaves afford good fodder.

5. *Pongamia glabra*, Vent.; Fl. Br. Ind. ii. 240. Brandis Ind. trees. 243. Gamble Man. Ind. Timb. 262. Vern. *karanja*, *kirmál*, Hind.

A moderate-sized tree, almost evergreen. *Bark* soft smooth grey. *Leaves* imparipinnate, 8-10 in. long, bright green, glabrous; leaflets 2-5 in. long, opposite, without stipels, usually 5-7, ovate-oblong or elliptic, subcoriaceous, shortly acuminate, veins prominent beneath. *Flowers* in pedunculate, axillary racemes shorter than the leaves; *pedicels* .3-.4 in. long, slender, pubescent, fascicled on the tumid nodes of the rachis. *Calyx* campanulate, mouth truncate. *Corolla* about .5 in. long, white or tinged with purple. *Stamens* 10, the 10th filament free at the base, connate with the others in the middle. *Pod* indehiscent, turgid, woody, obliquely oblong 1.5-2 in. long, 1-seeded.

Cultivated in gardens and along road-sides within the area.

The seeds yield a valuable medicinal oil and the leaves and root are also used in medicine. The wood is fairly hard, white, turning yellow on exposure, but is not durable. Fl. Hot season.

SUB-FAMILY II. CÆSALPINIÆ.

Mostly trees or shrubs. *Leaves* abruptly pinnate or bipinnate, sometimes 2-foliolate or simple and 2-lobed; leaflets rarely stipellate. *Flowers* 2-sexual, generally irregular. *Calyx* divided to or nearly to the base; lobes usually 5, rarely valvate, generally concave. *Petals* 5, imbricate, quite free, slightly unequal, the upper or odd petal innermost. *Stamens* normally 10, usually free, often declinate; anthers large. *Pod* often indehiscent. *Seeds* sometimes albuminous.

Analysis of the Genera.

Leaves bipinnate; petals 5	1 CÆSALPINIA.
Leaves pinnate.	
Petals 5; stamens free, usually more than 3 perfect	2. CASSIA.
Petals 3; stamens monadelphous, only 3 perfect	3. TAMARINDUS.
Leaves simple, 2-lobed; petals 5	4. BAUHINIA.

1. *Cæsalpinia*, Linn.

Trees, erect shrubs, or prickly climbers. *Leaves* abruptly bipinnate. *Flowers* showy, yellow, in axillary or terminal racemes, the latter often corymbose. *Calyx-lobes* 5, imbricate, hood-shaped, many times larger than the tube, the lowest largest. *Petals* 5, usually clawed, the uppermost smaller than the others. *Stamens* 10, free, declinate; anthers versatile. *Ovary* sessile, few-ovuled; style filiform. *Pod* various.

Analysis of the Species.

- | | | |
|------------------------------|-------|---------------------------|
| Pod armed with wiry prickles | . . . | 1. <i>C. Bonducella</i> . |
| Pod not armed, quite smooth | . . . | 2. <i>C. sepiaria</i> . |

1. **C. Bonducella**, Fleming; Fl. Br. Ind. ii. 254; Brandis For. Flora 156, Ind. Trees 246; Gamble Man. Ind. Timb. 267. Vern. *Káth Karanj*, Hind. 'The Fever-Nut.

A scandent prickly shrub. *Leaves* over a foot long; pinnae 6-8 pairs, 3-8 in. long; stipules large, 2-fid; rachis and its branches armed with recurved prickles. *Leaflets* 6-10 pairs on each pinna, opposite, .7-1 by .4-.6 in., oblong or elliptic, obtuse, mucronate, membranous, downy beneath, minutely petioluled. *Racemes* 6-12 in. long, gradually denser towards the top; pedicels .2-.3 in., downy; bracts .5 in. long, linear-lanceolate, generally recurved at the tip, exceeding the flower-buds. *Calyx* .2-.3 in. long, finely rusty-tomentose. *Petals* .4-.5 in. long, oblanceolate, yellow, the smallest sometimes spotted with red. *Pod* 2-3 by 1.5-2 in., coriaceous, dehiscent, thickly beset with sharp wiry prickles .2-.3 in. long. *Seeds* 2-3, .7 in. long, globose or ovoid, shining, lead-coloured, with numerous very fine horizontal cracks when dry.

SAHÁRANPUR and the DÚN, generally in abandoned village sites or in hedges; Sháhánpur; Dúdhli, Tháno, Khairi, etc. Also at Kálsi in JAUNSAIR.

The tender shoots and seeds which are known as fever nuts in some parts are used medicinally, the farina of the cotyledons, which is white and very bitter being considered a good substitute for quinine. It makes an effective hedge-plant.

Fl. Aug. Sept. Fr. Cold season.

2. **C. sepiaria**, Roxb.; Fl. Br. Ind. ii. 256; Brandis For. Flora 156, Ind. Trees 246; Gamble Man. Ind. Timb. 267. The Mysore-thorn. Vern. *Alai Dún*; *Ári*, Jaunsar; *Karanj*, Hind.

A large prickly climber, pubescent or downy; prickles strong, recurved or less frequently curved upwards. *Leaves* 9-16 in. long; pinnae 6-10 pairs, 2-4 in. long; stipules semisagittate, deciduous. *Leaflets* 8-12 pairs on each pinna, opposite, .6-.8 by .2-.4 in., oblong, very obtuse, green and glabrous above, glaucous beneath, minutely petioluled. *Racemes* simple, about 1 ft. long; pedicels .7-1 in. long, jointed at the top; bracts lanceolate, rusty tomentose. *Calyx* pale-yellow, about .5 in. long, deeply 5-lobed, pubescent or tomentose. *Petals* .5-.7 in. long, bright-yellow. *Stamens* .5 in. long, exerted; filaments thickened and woolly at the base. *Pod* 2.5-4, by about 1 in., somewhat woody, glabrous, obliquely cuspidate, tardily dehiscent. *Seeds* 4-8, ovoid, .4 in. long, rather compressed, smooth, mottled brown and black.

Common in swampy localities in the DŪN, and also in ravines in JAUNSAK and TEHRĠ-GARHWAL, ascending to 6,000 ft.—Nak-raunda, Jogiwāla, Bagŭr Block near Kathiān, Tons Valley, etc.

It is an excellent hedge-plant. The bark is astringent and may be used for tanning.

Fl. Mar., June. Fr. Rainy season.

2. *Cassia*, Linn.

1. *C. Fistula*, Linn.; Fl. Br. Ind. ii. 261 ; Brandis For. Flora 164, Ind. Trees 263 ; Gamble Man. Ind. Timb. 271. Vern. *Āmlāās*, Hind.; *Kirāla*, DŪn ; *Sināra*, Garhwal.

A moderate-sized tree, wholly glabrous ; bark greenish-grey, smooth up to middle age. *Leaves* paripinnate, 1-2 ft. long ; rachis terete. *Leaflets* 4-8 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, subcoriaceous, acuminate, entire ; lateral nerves parallel, numerous. *Flowers* bright-yellow, in thyrsoid pendulous axillary racemes 12-18 in. long ; pedicels 3-1 in., gradually longer towards the base of the raceme. *Calyx* 2-4 in. long, glabrous, caducous. *Petals* 3-1 in. long, shortly clawed, nearly equal. *Stamens* of 3 kinds.—3 about 1 in. long behind the ovary with large oblong anthers, 4-6 about 4 in. long in front of the ovary with diverging anther cells, the remaining 3-1 shorter and more slender being staminodes with indehiscent anthers ; anthers of fertile stamens open by terminal pores. *Ovary* shortly stipitate ; style incurved ; stigma terminal. *Pod* up to 2 ft. long, 1 in. diam. cylindrical, smooth, hard, indehiscent, dark-brown when fully ripe, obscurely transversely ribbed and transversely fragile, septate into numerous 1-seeded cells. *Seeds* about 4 in. diam., compressed, albuminous, parallel with the septa.

Common throughout the DŪN and SAHĀRANPUR FORESTS ; also found in low valleys up to 4,000 ft. in JAUNSAK and TEHRĠ-GARHWAL, e.g., Āmlāwa Valley up to Saiā.

The heartwood is yellowish or brick-red, tough, very hard and extremely durable, excellent for posts, carts and agricultural implements ; weight about 60 lbs. per c.ft. The dark-brown sweetish pulp of the ripe fruit is a strong purgative, and is an ingredient of spiced native tobacco. The gum exuded by the bark is astringent. The bark is used for tanning and dyeing. The twigs are often lopped for cattle fodder. It is a very handsome tree, and is often cultivated for ornament.

Scarcely ever wholly leafless. New leaves and fl. April-July. Fr. Cold season.

The following smaller plants belong to this Genus:—

1. *C. occidentalis*, Linn.; Fl. Br. Ind. ii. 262. Vern. *Chakunda*, Hind. A diffuse undershrub. *Leaflets* 2-4 by .6-1.3 in., elliptic-lanceolate, acuminate. *Flowers* .5-.7 in. diam.; petals yellow with reddish veins. *Pod* 3 by .4 in., compressed, glabrous. A weed common in blanks and along forest roads, especially in the Dún.

2. *C. Sophera*, Linn., Fl. Br. Ind. ii. 262. vern. *Kasunda*.

A diffuse shrub 4-7 ft. high, resembling the last species but stouter and with more numerous leaflets. *Leaflets* 6-10 pairs, lanceolate, acuminate, 1-3 in. long by .3-.75 in. broad. *Flowers* orange-yellow. *Pod* 3-4 in. long, straight or very slightly curved, subterete. *Seeds* 30-40.

Occasionally met with near villages but not as common as *C. occidentalis*. Various parts are used in medicine.

Fl. Rainy season.

3. *C. Tora*, Linn.; Fl. Br. Ind. ii. 263. Vern. *Panwir*, Dún. A gregarious annual with a whitish stem. *Leaflets* about 3 pairs, 1-1.7 by .7-1.3 in., obovate, mucronate. *Flowers* .4 in. diam., orange-yellow; sepals concave. *Pod* 6-9 by .15 in., tapering, curved, flexuose; seeds truncately cylindrical, about .2 in. long, length parallel to the sutures. A common weed in blanks and about villages in the Dún and in SAHÁRANPUR. Fl. July, Aug. Fr. Oct.-Dec.

4. *C. mimosoides*, Linn.; Fl. Br. Ind. ii. 266. A diffuse perennial. *Leaflets* very numerous, .5 by .1 in., linear-oblong, acuminate. *Flowers* yellow, .3 in. long, in 2-3-flowered axillary racemes. *Pod* flat, 2-2.5 by .2 in., 10-14-seeded. Dún,—Ráipur, Rámgarh, Lachiwála, etc. Fl. July, Aug. Fr. Sept.-Nov.

6. *C. glauca*, Lamk. var. *suffruticosa*, Prain; Fl. Br. Ind. ii. 265. A shrub about 10 ft. high. *Leaflets* 8-9 pairs, 1-1.5 in. by .35-.8 in., elliptic-oblong, obtuse, cuneate at the base, pale-green and glabrous above, glaucous and slightly pubescent beneath. *Flowers* about 1 in. diam., yellow, in axillary, corymbose racemes shorter than the leaves. *Pod* 3-4 in. long, linear, flat, thin, marked with distinct lines between the seeds.—Siwalik Hills; Dehra Dun; and possibly elsewhere, indigenous but scarce.

3. *Tamarindus*, Linn.

1. *T. indica*, Linn.; Fl. Br. Ind. ii. 273; Brandis For. Flora 163, Ind. Trees 252; Gamble Man. Ind. Timb. 278. The Tamarind tree. Vern. *Jmli*, *Amli*. Hind.

A large unarmed tree; bark dark-grey, with longitudinal fissures. *Leaves* abruptly pinnate; rachis 2-5 in. long; stipules small, caducous. *Leaflets* 10-20 pairs, opposite, .5-.7 by .15-.2 in., linear-oblong, obtuse, often emarginate, subcoriaceous, glabrescent, very minutely petioluled, with intramarginal nerves. *Flowers* in few-flowered, lax, sub-terminal racemes. *Calyx*-tube turbinate; teeth lanceolate, the two lowest connate. *Petals* only the 3 upper developed which are .4-.6 in. long, pale-white, variegated with red stripes, the middle one hooded, the two lower reduced to scales. *Stamens* only 3 perfect, monadelphous, the others reduced to bristles, anthers versatile. *Ovary* stipitate, the stalk adnate to the calyx-tube; ovules many; stigma capitate. *Pod* 3-8 by .8-1 in., oblong, slightly compressed, usually falcate, many-seeded, indehiscent with a crustaceous brittle epicarp which ultimately cracks irregularly; sutures indistinct. *Seeds* 5 in. diam., compressed, with a dark-brown or black hard shining smooth testa, embedded in a brown pulpy mesocarp.

Cultivated throughout the DÚN and SAHÁRANPUR DISTRICTS for its fruit; almost wild towards Hardwar.

Sapwood yellowish-white, hard and close-grained. Very old trees produce a scanty ebony-like dark purplish-brown heartwood which is very durable; annual rings indistinct; weight about 75 lbs. per c.ft. Wood highly prized, though extremely difficult to work. "It is used for wheels, mallets, planes, rice-pounders, oil and sugar mills and is an excellent wood for turning."—*Sir D. Brandis*. The fruit is an article of food and is also used in medicine. The leaves make an agreeable curry, and the inner substance of the seeds ground into paste gives a strong cement which is much used by book-binders.

Fl. May, June. Fr. Mar., April, i.e., 10-11 months after flowering.

4. *Bauhinia*, Linn.

Trees, shrubs or climbers. *Leaves* simple, more or less distinctly 2-lobed, palmately nerved. *Flowers* white, pink or purple, in simple or paniced racemes. *Calyx* gamosepalous, turbinate or tubular; limb 5-cleft, or split on one side (spathaceous) and minutely 5-toothed at the apex. *Petals* 5, sub-equal, usually clawed. *Stamens* 10, free, all or 3-5 perfect, the others rudimentary or absent; anthers versatile. *Ovary*

stalked, many-ovuled. *Pod* linear or oblong, flat, dehiscent or indehiscent. *Seeds* albuminous.

Analysis of the Species.

Fertile stamens 10; pod indehiscent.

Leaves not acid; calyx spathaceous; pod rigid, falcate 1. *B. racemosa*.

Leaves acid; calyx 5-cleft; pod flexible, straight 2. *B. malabarica*.

Fertile stamens 3-4, rarely 5; pod dehiscent.

Leaves cleft only at the tip or not cleft at all 3. *B. retusa*.

Leaves deeply cleft.

A climber. Lvs. often broader than long 4. *B. VahlII*.

Trees. Leaves as long as broad.

Leaves cleft nearly half way down; calyx-tube shorter than the limb. 5. *B. purpurea*

Leaves cleft scarcely through a third of their length; calyx-tube as long as the limb 6. *B. variegata*.

1. ***B. racemosa***, Lam.; Fl. Br. Ind. ii. 276; Brandis For. Flora 159, Ind. Trees 256; Gamble Man. Ind. Timb. 281. Vern. *Jhanjhorá*, *Jhinjhorá*, Dún and Saháranpur; *Pápri*, Saháranpur.

A small deciduous tree; bark dark bluish-brown, rough, with numerous deep vertical cracks. *Leaves* broader than long, .8-2 by 1-3 in., cleft nearly half way down, 7-9-nerved, slightly cordate, coriaceous, grey-pubescent beneath; petiole .5-7 in. long. *Raceme* 3-5 in. long, terminal and leaf-opposed; rachis downy. *Flowers* pale-white, about .5 in. long, on short pedicels; buds oblanceolate, pointed at the tip; bracts subulate, deciduous. *Calyx-tube* about .1 in. long; limb about three times as long, entire, 5-toothed, at length reflexed. *Petals* oblanceolate, as long as the calyx-limb. *Stamens* 10, all perfect, united at the base. *Stigma* sessile. *Pod* 5-8 by .7-1 in., sometimes longer, turgid, rigid, falcate, 12-20-seeded, glabrous, irregularly reticulate outside.

Common in blanks and the drier parts of forests in SAHÁRANPUR and the DÚN.

Wood light-brown, hard, weighing 50 lbs. per c.ft. It is fairly good, but not used except for fuel. The fibre of the bark is used to make ropes.

Fl. Mar.-June. Fr. Cold season.

2. **B. malabarica**, Roxb.; Fl. Br. Ind. ii. 277; Brandis For. Flora 159, Ind. Trees 256; Gamble Man. Ind. Timb. 282. Vern. *Amli*, Hind.; *Khat Pápri*, Saháranpur; *Khatta Jhanjhorá* or *Jhin-jhorá*, Imli, Dún; *Khatuá*, Garhwal.

A moderate-sized deciduous tree; bark dark-brown, exfoliating in thin long strips, fibrous, red inside. *Leaves* acid, broader than long, 1·5-4 by 2·5 in., cleft through about a third of the length, 7-9-nerved, slightly cordate, coriaceous, glabrate and glaucous beneath; petiole ·8-1·2 in. long, rusty-pubescent. *Racemes* axillary, sessile, 1·5-2 in. long, often 2-3 together. *Flowers* ·5 in. long, dull-white, on very slender pedicels which are 1 in. long; buds obovoid, rounded at the tip. *Calyx* brown-tomentose; tube ·15 in. long; limb slightly longer, 5-cleft. *Petals* equal, spathulate, ·4-·5 in. long. *Stamens* 10, all perfect, alternately longer and shorter, slightly united at the base. *Style* produced. *Pod* 7-12 by ·7-1 in., on a stalk 1 in. long, flat, flexible, many-seeded, more or less straight, gradually tapering to the tip, marked with regular reticulate veins which, starting diagonally from both sutures, meet in the middle.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in the Sal areas.

Wood light reddish-brown, coarse-grained; weight 48 lbs. per c.ft. It is never used, except for fuel. The acid leaves are eaten.

Fl. Aug.-Oct. Fr. Jan.-May.

3. **B. retusa**, Ham.; Fl. Br. Ind. ii. 279; Brandis For. Flora 161, Ind. Trees 257; Gamble Man. Ind. Timb. 282. Vern. *Semla*, Hind.

A moderate-sized tree; individuals that escape tapping attaining a fairly large size; bark dark-brown, with a few shallow vertical cracks, but usually much disfigured by the diagonal cuts that are made to tap its gum. *Leaves* 4-6 in. diam., rather broader than long, entire or cleft only at the tip, cordate or truncate, 9-11-nerved, coriaceous, more or less pubescent beneath; petiole 1·5-3·5 in. long. *Flowers* ·5 in. long, in large corymbosely branched terminal panicles; buds ovoid-globose. *Calyx* ·2-·3 in. long, split into 2-3 sections nearly to the base. *Petals* ·3-·4 in. long, obovate, yellow, with red spots and purple veins, clawed, pubescent. *Stamens* only 3 perfect. *Ovary* hairy below; stipe adnate to the calyx-tube; style produced; stigma large. *Pod* 4-7 by 1·2-1·5 in., flat, oblongeolate, deep-red until ripe, glabrous, hard, tardily dehiscent, seeds flat, about ·5 in. diam., dark-brown, smooth.

Fairly common in the SIWALIK TRACT and in places in the OUTER HIMALAYA: Málkot, below Jaharipani, Paléd, Bindál-nálá near Dehra, Timli Pass, Sháhjahánpur Ráu, etc.

Wood reddish-white, hard, close-grained; weight 58 lbs. per c.ft. It is not used. A clear gum resembling gum-arabic is collected by making cuts in the bark, and is largely exported from the DÚN. It is used in medicine, and in the manufacture of sweetmeats.

Fl. Sept.-Nov. Fr. Feb., Mar.

4. **B. Vahlíi**, W. & A.: Fl. Br. Ind. ii. 279; Brandis For. Flora 161, Ind. Trees 258; Gamble Man. Ind. Timb. 283. Vern. *Máljhan*, *Málo*, Hind.

A gigantic evergreen climber; branchlets often terminating in a pair of revolute tendrills; young branches, petioles and leaves beneath, especially along the nerves, densely rusty-or grey-velvety. *Leaves* very variable in size, often up to 18 in. across, as broad as long or broader, deeply cordate, 11-15-nerved, cleft through about a third of the length, sub-coriaceous, dark-green and glabrescent above, more or less downy beneath; lobes obtuse, rounded; petiole 3-6 in. long, stout. *Flowers* white, in terminal corymbs or corymbose racemes; pedicels 1-2.5 in. long, slender, with a lanceolate caducous bract at the base and a pair of small bracteoles above the middle, all densely woolly. *Calyx-tube* .2-.3 in. long; limb .6-1 in. long, splitting into two lobes, densely rusty-tomentose. *Petals* 1-1.7 in. long, obovate, shortly clawed, white-canescient outside along the middle. *Stamens* 3. *Ovary* hairy, adnate to the calyx-tube. *Pod* 9-12 by 2-3 in., flat, woody, rusty-velvety. *Seeds* 8-12 about 1 in. diam., flat.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in moist localities and shady hill-slopes; also in the OUTER HIMALAYA, up to 3,000 ft.

It often attains an enormous size, stems 4-5 ft. in girth not being uncommon. There is a famous climber on the left bank of the Kasumri Ráu above the temples which measured 6 ft. 7 in. in girth in January 1899. The stem consists of a mass of phloem tissue which is traversed by strands of xylem of various thicknesses round the pith, together presenting a beautiful floral design on a transverse section. "Its large flat leaves are sewn together and used as plates, cups, rough table-cloths, umbrellas and rain caps; its pod is roasted and the seeds eaten; its bark is made into rough ropes."—*Mr. J. S. Gamble*. It is, however, one of the greatest enemies of forest trees, and every attempt is made to exterminate it where possible.

Fl. April-June. Fr. Cold season.

5. **B. purpurea**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora. 160, Ind. Trees 258; Gamble Man. Ind. Timb. 283. Vern. *Khairwál*, Dún; *Khairwál Pápri*, Saháranpur; *Guirál*, Garhwal.

A moderate sized tree; bark ash coloured or dark-brown; young parts covered with brown pubescence. *Leaves* 3-6 in. long, rather longer than broad, 9-11-nerved, cordate, less frequently truncate, coriaceous, cleft about half-way down; lobes usually sub-acute, sometimes overlapping at the inner margins; petiole 1-1.5 in. long. *Flowers* deep-rose, in paniculate or corymbose racemes; pedicels .2-5 in. long, tomentose; buds obovoid or oblong, acute, strongly 5-ribbed. *Calyx-tube* .3-4 in. long; limb nearly twice as long, slit on one side, 5-toothed at the apex. *Petals* rosy-purple, 1.5-2 in. long, oblanceolate, clawed, with a distinct midrib and fine straight lateral veins. *Stamens* usually 3 fertile, slightly shorter than the petals; staminodes filiform, of varying lengths. *Ovary* long-stalked; style long; stigma large, oblique. *Pod* 6-10 by .6-.8 in., on a tomentose stipe .6-1 in. long, thick, pointed, slightly falcate, greenish-purple, pubescent along the sutures, late in dehiscing; seeds 12-15.

Common in the SAHÁRANPUR SIWALIKS; also found in the DÚN and in the Tons Valley in JAUNSAK.

The heartwood is of a reddish-brown colour, moderately hard, fairly close-grained; weight about 50 lbs. per c.ft. It is used for agricultural implements and in construction. The bark is used for tanning, the leaves are lopped for cattle and camel fodder, and the flower-buds are eaten cooked or pickled. Often cultivated for its flower.

Fl. Sept.-Nov. Fr. Jan.-Mar.

6. **B. variegata**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora 160, Ind. Trees 258; Gamble Man. Ind. Timb. 284. Vern. *Kachnár*, Dún; *Goriáo*, Jaunsar.

A fairly large tree, closely resembling the last species. *Leaves* 4-6 in. long, as broad as long or sometimes broader, usually deeply cordate, 11-15-nerved, sub-coriaceous, cleft through about a quarter; lobes obtuse; petiole 1-1.5 in. *Flowers* large, fragrant, sessile or shortly pedicelled, in few flowered lateral corymbs. *Calyx-tube* .5-1.2 in. long, slender; limb spathaceous, as long as the tube, 5-toothed at the apex, pubescent outside. *Petals* about 2 in. long, obovate or oblong, generally four white and one red, with a strong midrib and red or purple lateral veins radiating from near the base. *Fertile stamens* 5, rarely 3 or 4. *Ovary* long-stalked; style long; stigma minute. *Pod* 6-10 by .7-.9 in., hard, flat, glabrous, slightly falcate, dehiscent; seeds 10-15.

Occurring in the same localities as the last species, but is more common in the DŪN and in valleys in the HILLS, *e.g.*, Amlāwa and Tons Valleys.

Wood grey, moderately hard ; weight 42 lbs. per c.ft. Economic uses as of the last species.

Fl. Feb.-April when leafless. Fr. Rainy season.

Saraca indica, Linn.; Fl. Br. Ind. ii. 271 ; Brandis Ind. Trees 250. Vern. *Asok*.

An evergreen tree. *Leaves* equally pinnate, 6-10 in. long : *leaflets* 3-6 pairs, oblong-lanceolate, glabrous, 4-8 in. long. *Flowers* in dense corymbs 3-4 in. diameter, from old wood, orange on opening gradually changing to scarlet. *Bracts* and *bracteoles* and *calyx* petaloid. *Petals* 0. *Stamens* 7-8, much exserted. *Pod* 6-10 in. long, flat. Cultivated in gardens and near temples. It is regarded by Hindus as sacred.

SUB-FAMILY III. MIMOSÆ.

Usually trees or shrubs. *Leaves* abruptly bipinnate. *Flowers* regular, minute, in heads or spikes. *Sepals* 5, usually combined, valvate. *Petals* 5, equal, more or less connate, valvate. *Stamens* definite or indefinite, hypogynous, generally much exserted ; anthers small. *Pod* various. *Seeds* without albumen.

Analysis of the Genera.

Joints of pod separating ; stamens 8-10,
free 1. MIMOSA.

Joints of pod not separating ; stamens indefinite.

Armed.* Stamens free 2. ACACIA.

Unarmed. Stamens more or less connate 3. ALBIZZIA.

* Some Australian Acacias are not armed.

Mimosa, Linn.

1. ***M. himalayana***, Gamble.; Syn.—*M. rubicaulis*, Lamk.; Fl. Br. Ind. ii. 291 (in part); Brandis For. Flora 172, Ind. Trees 263; Gamble Man. Ind. Timb. 290. Vern. *Alây*, Dûn; *Al*, Sahâranpur.

A straggling prickly shrub; young branches red (whence the specific name), closely ribbed, thickly beset with short recurved prickles. *Leaves* 4-6 in. long, with prickly rachis; pinnae usually opposite, 4-10 pairs, 1-1.5 in. long, not armed. *Leaflets* 12-28 on each pinna, .15-.3 in. long, oblong, unequal-sided, caducous. *Flowers* tetramerous, red to white, in globose heads which are .4-.6 in. across; peduncles 1-2 in. long. *Calyx* campanulate, shortly toothed. *Petals* .04 in. long, connate at the base. *Stamens* usually 10, exserted. *Pod* 3-4 by .4 in., linear-oblong, 5-10-seeded, slightly falcate, glabrous; joints square, separating from the sutures before dehiscing.

Common in grass-lands and fallows in the Dûn and in râubeds in the SAHÂRANPUR SIWALIKS. Also found in valleys in the HILLS up to 5,000 ft.

Heartwood red, hard; weight 40-50 lbs. per c.ft. It can be used for tent-pegs and such other purposes.

Fl. July-Sept. Fr. Nov.-Jan.

M. pudica, Linn.; Fl. Br. Ind. ii. 291,—the well known Sensitive plant, Vern. *Lajwantî*, Hind.;—is cultivated and also found wild in waste lands in the Dûn. *Rachis* 1-1.5 in. long. *Pinnae* 1.5-2 in. long, approximate at the end of the rachis and spreading to look like digitate, very sensitive. *Leaflets* .2-.3 in. long, sensitive. *Flower-heads* long-peduncled. *Pod* .5-.8 in. long, with densely prickly sutures. Fl. Aug., Sept. Fr. Nov., Dec.

2. ***Acacia***, Willd.

Erect or climbing shrubs or trees, armed with stipular spines and prickles (in India). *Leaves* bipinnate; leaflets minute. *Flowers* yellow or white, hermaphrodite or polygamous, in globose heads or cylindrical spikes. *Calyx* campanulate, short-toothed. *Petals* valvate, more or less connate towards the base. *Stamens* indefinite, free, much exserted; anthers minute.

Pod dry or fleshy, dehiscent or indehiscent; seeds compressed.

Analysis of the Species.

Trees or erect shrubs.

Flowers in axillary globose heads; spines straight.

Pod short, cylindrical; seeds in two rows 1. *A. Farnesiana*.

Pod long, not cylindrical; seeds in one row.

Pod convex, downy, deeply indented between the seeds 2. *A. arabica*.

Pod flat, glabrous, slightly contracted between the seeds 3. *A. pseudo-eburnea*.

Flowers in axillary cylindrical spikes; spines recurved 4. *A. Catechu*.

Climbing shrubs. (Flowers in copiously paniced globose heads).

Pod succulent, thick 5. *A. concinna*.

Pod dry, thin.

Stems fluted.

Flower heads in bud pubescent; young pods rusty velvety 7. *A. torta*.

Flower heads in bud glabrous, young pods pubescent but not velvety 6. *A. Gageana*.

Stems round. 8. *A. pennata*.

1. *A. Farnesiana*, Willd.; Fl. Br. Ind. ii. 292; Brandis-For. Flora 180. Ind. Trees 263; Gamble Man. Ind. Timb. 292. Vern. *Walāyṭi Kikar*, Hind.

A thorny shrub, 12-15 ft. high, with dark-brown smooth bark; branches marked with grey dots and armed with stipular spines .3-.5 in. long. *Leaf-rachises* 1.5-2 in. long, downy; *pinnæ* 4-8 pairs, 1-1.5 in. long. *Leaflets* 20-40 on each pinna, very small, rigid. *Flowers* bright-yellow, exceedingly sweet-scented, in globose heads which are .4-.6 in. diam.; peduncles .5-.8 in. long, slender, crowded in the axils of the leaves, with a whorl of bracts at the apex. *Calyx* and *corolla* 5-toothed. *Pod* 2-3 by .5 in., cylindrical, turgid; dark-brown, with a double row of seeds.

It is a native of tropical America and is, no doubt, introduced, but is quite wild now in the DÚN and SAHÁRANPUR DISTRICTS, e.g.,

beds of the Suswá river; Pathri Forest; Barkalá, etc. Also cultivated in gardens for its flower.

Wood white, hard, close-grained; weight about 50 lbs. per c.ft. An excellent perfume is extracted from the flower.

Fl. Jan.-Mar. Fr. June, July, but remains long on the plant.

2. **A. arabica**, Willd.; Fl. Br. Ind. ii. 293; Brandis For. Flora 180, Ind. Trees 264; Gamble Man. Ind. Timb. 292. Vern. *Babul*, Hind.; *Kikar*, Saháranpur and the Punjab.

A moderate-sized tree with a large spreading crown; bark dark-brown, almost black, much fissured; spines .5-2 in. long, straight, white, sharply pointed. *Leaves* 1-2 in. long; rachis and pinnæ downy; pinnæ 3-6 pairs, .5-1.2 in. long, with several glands at their insertions. *Leaflets* 10-20 pairs, .1-2 in. long, linear, glabrous. *Flowers* yellow, fragrant, in axillary globose heads which are about .5 in. diam; peduncles in fascicles of 3-5, short, slender, grey-downy, with a whorl of bracts above the middle. *Calyx* cup-shaped, .04 in. long. *Corolla* twice the length of the calyx. *Pod* generally solitary, 4-6 by .5-.6 in., 8-12 seeded, stalked, convex, rather fleshy, deeply indented between the seeds, densely grey-downy, tardily dehiscent.

Cultivated in the SAHÁRANPUR DISTRICT, and apparently self-sown in many places, e.g., at Ránipur, Jawálapur, Tirá, etc.

Sapwood large, whitish; heartwood becoming reddish or dark brown on exposure; weight about 55 lbs. per c.ft. The latter is hard and very durable, and is used for wheels, well-curbs, sugar- and oil-presses, rice-pounders and for ploughs and other agricultural implements. The gum is readily soluble in water and is largely collected and used for various purposes. The pod is a favourite food for cattle, sheep and goats, and is very rich in tannin before ripening.

Fl. Rainy season. Fr. Cold season.

3. **A. pseudo-eburnea**, J. R. Drum. ; Syn.—*A. eburnea*, Willd. (in part); Fl. Br. Ind. ii. 293; Brandis For. Flora 183, Ind. Trees 264; Gamble Man. Ind. Timb. 294. Vern. *Pahári Kikar*, Saháranpur; *Kikar*, Dún.

A small deciduous tree with rough dark-grey bark; spines straight, generally dark-brown and about .5 in. long, the larger ones white and up to 2 in. long. *Leaves* 1-1.5 in. long; pinnæ usually 4 pairs, .3-.5 in. long, the uppermost pair with a large gland at the insertion besides often a second one below the lowest pair. *Leaflets* 6-12 pairs, about .1 in. long, oblong. *Flowers* pale-yellow, in axillary globose heads about .5 in. diam.; peduncles 1 in. long,

filiform, with an involucre of connate bracts about .3 in. from the base. *Calyx* funnel-shaped, .04 in. long. *Corolla* about twice the length of the calyx. *Pod* 2-4 on the same peduncle, 3-6 by .25 in., narrow-linear, flat, stalked, rigidly coriaceous, glabrous, shining, slightly contracted between the seeds.

Common in the SAHÁRANPUR SIWALIKS, generally in beds of ráus, where it is associated with *Khair*. Also found in the DÚN, e.g., at Saháranpur and Dharmawāla.

Wood yellowish-white, extremely hard, splitting in drying; weight 52 lbs. per c.ft. It is used chiefly as fuel, especially for lime-burning.

Fl. Cold season, rarely Mar., Apl. Fr. about 4 months after flowering, generally Apl., May.

4. **A. Catechu**, Willd.; Fl. Br. Ind. ii. 295; Brandis For. Flora*186; Gamble Man. Ind. Timb. 292. Vern. *Khair*, Hind.

A moderate-sized tree with thorny branches; stipular spines in pairs, short and recurved, shining-brown or nearly black; bark rough, dark-grey or ash-coloured, exfoliating in long narrow rectangular flakes. *Leaves* 4-7 in. long; rachis prickly and with 4-5 glands; pinnae 20-60, 1-1.3 in. long. *Leaflets* 60-100 on each pinna, about .15 in. long, ligulate. *Flowers* pale-yellow or cream-coloured, in lax axillary cylindrical spikes which are 3-4 by .4 in.; peduncle .5-.7 in. *Calyx* about .04 in. long, grey-tomentose. *Corolla* two to three times longer than the calyx. *Stamens* numerous, much exerted. *Pod* 2-3.5 by .5-.6 in., on a stalk .2-.3 in. long, straight, flat, dry, dark-brown, shining, 5-6-seeded. *Seeds* .2 in. diam., orbicular, flat, dark-brown.

Common in the DÚN and the SAHÁRANPUR SIWALIKS, generally in ráu-beds, either pure or mixed with *Sissu*; occasionally also in mixed scrub forests and on hill-sides away from the ráus.

Sapwood comparatively large, yellowish-white, not durable. Heartwood dark-red, so hard as to be proof against white-ants, hence very durable, seasons well and takes a fine polish. The weight varies between wide limits, the average being about 60 lbs. per c.ft. Pores distinct, being usually filled with a white substance which is in fact the *kathi* or catechin. This substance, as well as the cutch-products of great commercial value—are obtained by boiling chips of heartwood in earthen pots. The wood is used for rice-pestles, sugarcane- and oilseeds-crushers, ploughs, sword-handles and various other purposes. There is, however, a local superstition against it, in common with other thorny trees, owing to which it is never used in house-building in this part of the United

Provinces. It yields the best charcoal for blacksmith's work. The astringent bark is sometimes used for tanning.

Fl. May-July. Fr. Nov.-Jan., but remains long on the tree after ripening.

5. *A. concinna*, DC.; Fl. Br. Ind. ii. 297; Brandis For. Flora 188, Ind. Trees 269; Gamble Man. Ind. Timb. 291. Vern. *Allah*, Hind.

A large climbing shrub, suberect up to about middle age; stem terete, greyish-brown, with 5 vertical lines of strong conical prickles; branches grey-canescant. *Leaf-rachises* 4-8 in. long, downy, with a large gland about .5 in. above the base and a smaller one between the uppermost pinnæ; pinnæ 3-6 pairs, 2-3.5 in. long; stipules .25-.3 in. long, lanceolate. *Leaflets* acid, 6-20 but generally 10-14 pairs on each pinna with a small odd one near the base, .5-.6 by .1-.25 in., linear, oblique at the base, quite rounded at the tip, membranous, pale-green above, glaucous beneath; midrib somewhat diagonal. *Panicles* 3-4 ft. long, interrupted with leaves at the base of the ramifications; peduncles 1-1.5 in. long, slender, downy, in fascicles of 2-4, lower in the axils of the leaves, upper bracteate; bracts .15-.25 in. long, obliquely obovate-cordate, deciduous. *Heads* .4-.5 in. diam., 55-60-flowered, brick-red in bud. *Flowers* .2 in. long. *Calyx* deep-crimson, about .1 in. long, tubular, deeply 5-toothed; teeth subacute. *Petals* acute, white with a reddish median line, slightly exserted. *Stamens* numerous, much exserted, at first white, withering yellow; filaments very slender. *Pod* 3-4 by .7-1 in., straight, thick, fleshy, 6-10-seeded, slightly indented between the seeds; sutures broad.

Nawáda in the DÚN, and in the Amláva valley near Tilwári in JAUNSAIR; rather rare, but remarkably gregarious where it occurs.

The pods are used for washing the hair, and the acid leaves are eaten.

Fl. Apl. May. Fr. Cold season.

6. *A. Gageana*, Craib; Kew Bull (1915) p. 409.

A large prickly scrambling shrub; young shoots, petioles and inflorescence more or less pubescent, older stems fluted and angled. *Leaf-rachis* 4.4-7.5 in. long, with a sessile gland near the base, and often similar glands between the upper 1-3 pairs of pinnæ, sometimes 1-3 small glands on the pinnæ between the upper pairs of leaflets; stipules linear, caducous; pinnæ 7-14 pairs, 2-4 in. long; leaflets usually 15-30 pairs, sometimes fewer or more numerous, .25-.5 in. long by about .06-.15 in. broad, glabrous and shining above, pale and pubescent especially on the nerves beneath.

Panicles large terminal. **Flowers** pale creamy-white, in globose, pedunculate heads $\cdot 4\text{--}5$ in. diameter, practically glabrous in bud; **peduncles** $\cdot 6\text{--}8$ in. long, generally 1-3-nate. **Pod** 5-6 in. long by $\cdot 8\text{--}1\cdot 2$ in. broad, strap-shaped, finely pubescent when young, glabrous when mature, brown, the sutures scarcely thickened.

Fairly common near Kalsi, also found in the Sahāranpur Siwaliks and in ravines near Dehra, e.g., Kalsi, Kasunri, etc.

Fl. Aug.-Sept. Fr. Dec.-April.

This species can always be distinguished from the next species, *A. torta*, Craib by the leaflets which are glabrous on the upper surface, and by the glabrous flower heads. The petiolar glands also afford a distinguishing character in that they are flat or convex in *A. Gageana* while they are conical in *A. torta*.

7. **A. torta**. Craib; Kew Bull. (1915), p. 410; Syn. *A. carisia* W. & A. (non Willd.).

A large prickly climbing shrub, young shoots, petioles and inflorescence densely pubescent, older stems prominently fluted and 5-angled. **Leaf-rachis** 5-8 in. long, with a conical pubescent gland near the base, and smaller glands between the upper pair or pairs of pinnæ; **pinnæ** 10-15 pairs, 2-4 in. long; **leaflets** usually 25-40 pairs, sometimes fewer, $\cdot 15\text{--}\cdot 3$ in. long by $\cdot 07\text{--}12$ in. broad, pubescent on both surfaces. **Panicles** large, terminal. **Flowers** pale creamy white, in globose, pedunculate heads, $\cdot 4\text{--}5$ in. diameter, pubescent in bud; **peduncles** $\cdot 4\text{--}7$ in. long, 1-5-nate. **Pod** 4-6 in. long by $\cdot 7\text{--}1\cdot 2$ in. broad, flat, rusty velvety, when young, glabrous when mature, the sutures strong, thickened.

Occasionally met with in the Dún and Sahāranpur Siwaliks.

Fl. Rainy season. Fr. Dec.-Feb.

8. **A. pennata**, Willd.; Fl. Br. Ind. ii. 297; Brandis For. Flora 189; Gamble Man. Ind. Tîmb. 300. Vern. *Āgīā-bel*, *Āglā*, *Ālāy*, Dún.

A prickly climber, attaining a larger size than any other climbing *Acacia*; bark reddish-brown, with horizontal cracks. **Leaf-rachises** 6-10 in. long, not angled, downy, with a large dark brown gland near the base of the petiole, and several between the upper pinnæ, closely prickly; **pinnæ** 10-15 pairs, 2-3 in. long. **Leaflets** 80-100 on each pinna, $\cdot 2\text{--}3$ by $\cdot 03\text{--}05$ in., firm, quite glabrous, dark-green and shining above. **Panicles** 1-5-2 ft. long; **peduncles** 1-4 together, $\cdot 6\text{--}9$ in. long, finely downy. **Heads** $\cdot 5$ in. diam. **Flowers** pale, smaller than in the last three species. **Pod** 4-6 by $\cdot 6\text{--}1$ in., straight, strap-shaped, reddish-brown, glabrous, 8-12-seeded; **stalk** $\cdot 25$ in. long; sutures raised.

Very common in the DÚN and SAHÁRANPUR FORESTS, especially in the moister parts, spreading over the tallest trees.

Wood yellowish-white, porous, moderately hard.

Fl. June-Aug. Fr. Nov.-Jan.

3. *Albizzia*, Durazz.

Unarmed trees. *Leaves* bipinnate; leaflets opposite. *Flowers* 2-sexual, in large globose heads, usually white or rose-coloured. *Calyx* tubular or campanulate, distinctly toothed. *Petals* 4-5, valvate, united below the middle. *Stamens* indefinite, many times the length of the corolla: filaments united at the base, sometimes forming a long sheath. *Ovary* sessile or shortly stalked; style filiform; stigma minute. *Pod* large, thin, flat, strap-shaped, straight, sub-indehiscient: seeds compressed.

Analysis of the Species.

- | | |
|--|-----------------------------|
| Flower-heads on corymbosely arranged simple peduncles; flowers shortly pedicelled. | |
| Leaflets few, oblong, more than .5 in. broad | 1. <i>A. Lebbek</i> . |
| Leaflets many, falcate and tapering, scarcely .2 in. broad | 4. <i>A. Julibrissin</i> . |
| Flower-heads in panicles; flowers sessile. | |
| Leaflets ovate-oblong, more than .5 in. broad | 3. <i>A. procera</i> . |
| Leaflets linear-oblong, about .2-.3 in. broad | 2. <i>A. odoratissima</i> . |
| Leaflets falcate and tapering, scarcely .1 in. broad | 5. <i>A. stipulata</i> . |

1. *A. Lebbek*, Benth.; Fl. Br. Ind. ii. 298: Brandis For. Flora 176. Ind. Trees 271; Gamble Man. Ind. Timb. 303. Vern. *Siris*, *Sirs*, *Sírá*, or *Sírá*, Hind.

A large deciduous tree with a spreading crown; bark dark-grey, irregularly cracked. *Leaf-rachises* 5-6 in. long, stout, with a large oblong gland near the base, and 1 or more smaller ones between

the upper pinnæ ; pinnæ 2-6 pairs, 4-6 in. long. *Leaflets* 4-9 pairs, 1·3-2 by ·7-1 in., shortly petioluled, oblong, oblique, obtuse, glabrous or glabrescent ; midrib nearly parallel to the upper edge ; lateral nerves not very prominent. *Peduncles* 2-4 in. long, downy, in fascicles of 2-4 from the upper axils, forming short corymbose racemes ; heads many-flowered. *Flowers* greenish-white, shortly pedicelled, fragrant, about 1·5 in. long to the extremities of the stamens. *Calyx* funnel-shaped, ·15 in. long, short-toothed. *Corolla* twice the length of the calyx ; segments lanceolate. *Filaments* 1-1·5 in. long, rose-tinted, united inside the calyx-tube. *Pod* 8-12 by 1·2-1·7 in., flat, thin, firm, straw-coloured, 6-10-seeded, with brown spots and depressions alternately on either side over the seeds.

Common, though not numerous, in the DÚN and SAHÁRANPUR FORESTS, and also in low valleys in JAUNSAH, generally along banks of streams.

Sapwood large, white ; heartwood dark-brown, mottled and streaked with a darker colour, tough, hard, fairly durable, seasons well, and takes a fine polish ; weight 50-55 lbs. per c.ft. It is used for sugarcane-crushers, oil-mills, well-curbs, wheel-work and furniture. The leaves and twigs are lopped for camel-fodder. The tree is often planted in avenues. It is a rapid grower and can be easily propagated by cuttings.

New leaves Mar., April. Fl. April, May. Fr. Oct., Nov., but remains long on the tree.

2. *A. odoratissima*, Benth. : Fl. Br. Ind. ii. 299 ; Brandis For. Flora 175, Ind. Trees 271 ; Gamble Man. Ind. Timb. 304. Vern. *Káli Siris*, Hind.

A fairly large tree having a general dark appearance ; bark dark-grey with patches of darker colour ; extremities grey-tomentose. *Leaf-rachises* 4-7 in. long, downy, with a gland near the base and 1-2 more at the points of insertion of the upper pinnæ ; pinnæ 3-8 pairs, 3-5 in. long. *Leaflets* 8-20 pairs, generally about 1 by ·2 in., sometimes much broader, linear-oblong, unequal-sided, acute, minutely mucronate, dark-green, glaucous beneath ; midrib parallel to the upper edge and close to it. *Inflorescence* a terminal (rarely axillary) panicle, 10-15 in. long, with corymbose branches on which the peduncles are disposed in fascicles. *Heads* few-flowered ; peduncles ·5-·8 in. long. *Flowers* sessile, pale-white, fragrant. *Calyx* about ·04 in. long, hairy. *Corolla* silky ; segments ·1 in. long, lanceolate. *Stamens* about 1 in. long. *Pod* 6-12 by 1-1·2 in., 8-12-seeded, flexible, reddish-brown or dusky-green, with darker blotches indicating the position of the seeds.

Occurs sporadically in SAHĀRANPUR and the DŪN. Also in JAUNSAH up to 5,000 ft.

Sapwood rather large, white; heartwood dark-brown with darker streaks, very hard, fairly durable, seasons well, and takes a fine polish; weight 54 lbs. per c.ft. It is used for wheels, oil-mills and furniture. The leaves and twigs are lopped for cattle-fodder.

Scarcely ever quite leafless. New leaves Mar., April. Fl. April-June. Fr. Jan., Feb., but remains long on the tree.

3. **A. procera**, Benth.; Fl. Br. Ind. ii. 299; Brandis For. Flora 175, Ind. Trees 271; Gamble Man. Ind. Timb. 305. Vern. *Karha*, *Karhār*, *Karhāi*, Dūn; *Safed Siris* or *Siras*, Hind.

A very large graceful tree with a deep oval crown when growing in the open; bark yellowish or greenish-white, smooth, peeling off in thin flakes, often with horizontal lines. *Leaf-rachises* 10-15 in. long, glabrous or pubescent, with a large gland near the base; pinnae 3-5 pairs, 6-9 in. long. *Leaflets* 12-24 on each pinna 1-2 by .6-.9 in., shortly petioluled, obliquely oblong-ovate, glabrous; midrib diagonal and nearer the lower-edge; lateral nerves rather prominent. *Heads* about .5 in. diam., 15-20-flowered, in fascicles of 2-5, arranged on large lax corymbosely branched terminal panicles which are 1-2 ft. long; peduncles .5-1 in., the lower from the axils of the upper leaves. *Flowers* yellowish-white, sessile, about 3 in. long. *Calyx* about .1 in. long, tubular, shortly toothed. *Corolla* .15 in. long, deeply cleft; segments oblong. *Stamens* a little more than twice the length of the corolla. *Pod* 4-6 by .6-.9 in., glabrous, brown, 8-12-seeded with darker blotches over the seeds.

SAHĀRANPUR and the DŪN in mixed forests and generally in moist localities, e.g., Kāluwāla, banks of the Re nadi, khairi swamp, etc. Planted in avenues in Dehra and Saharanpur.

Sapwood large, of a white colour, not durable. Heartwood light or dark brown, straight and even-grained, hard though rather porous, takes a fairly good polish, seasons well and is durable; weight 46 lbs. per c.ft. "It is largely used for sugarcane-crushers, rice-pounders, wheels, agricultural implements, bridges, and house-posts,"—*Sir D. Brandis*. Its charcoal is considered very good. The bark is used for tanning, and is eaten mixed with flour in times of scarcity.

Fl. June-Aug. Fr. Cold season.

4. **A. Julibrissin**, Durazzini.; Fl. Br. Ind. ii. 300; Brandis For. Flora 177, Ind. Trees 272. Syn.—*A. mollis*, Boivin. Gamble Man. Ind. Timb. 306. Vern. *Bhondir Kurmurā*, Jaunsar.

A sparingly-branched moderate-sized deciduous tree; bark dark-grey, smooth, with long horizontal wrinkles. *Leaf-rachises* 6-12 in. long, bearing glands at the base and also between the upper pinnae; pinnae 6-12 pairs, 3-5 in. long. *Leaflets* 10-25 pairs, .5-.7 in. long by .15-.2 in. at the base, falcate, acute, very oblique, sensitive, midrib very close and parallel to the upper edge, which is quite straight. *Peduncles* 2-3 in. long, fasciated, corymbosely disposed at the axils of the fallen upper leaves. *Flowers* rose-coloured 1-1.5 in. long, very shortly pedicelled. *Calyx* and *corolla* tubular, pubescent, the former .1 in., the latter .3 in. long and with lanceolate segments. *Filaments* 1 in. long, very slender, rose-coloured. *Pod* 3-5 by .6-.9 in., linear, thin, rather membranous, uniformly pale-brown or yellow, softly tomentose until mature, afterwards glabrous, 8-12-seeded.

JAUN SAR and TEHRI-GARHWAL, up to 5000 ft. usually in open sunny ravines--Dhārīgādh; Mautīgādh, etc.

Sapwood large; heartwood dark, almost black in old trees, hard, strong, and takes a good polish; weight about 47 lbs. per c.ft. It is used for furniture.

Fl. April-June. Fr. Sept.-Nov., but remaining long on the tree.

5. *A. stipulata*. Boivin; Fl. Br. Ind. ii. 300; Brandis For. Flora 178, Ind. Trees 272, 709; Gamble Man. Ind. Timb. 306. Vern. *Siran*, Hind.

A large flat-topped tree of very rapid growth, remarkable for its large semi-cordate acute membranous pubescent *stipules*, whence the specific name; bark grey, with short vertical wrinkles crossed by deeper horizontal furrows. *Leaf-rachises* 7-12 in. long, bearing many glands; pinnae 6-16 pairs, 4-6 in. long. *Leaflets* 20-40 pairs, .3-.5 in. long by about .1 in. at the base, falcate, tapering to a sharp point from a broad base; midrib so close to the straight upper edge as to be hardly distinguishable from it. *Heads* in axillary paniced racemes. *Flowers* yellowish-white, slightly tinged with red. *Calyx* funnel-shaped, about .1 in. long, short-toothed, pubescent. *Corolla* twice the length of the calyx; segments ovate, pubescent. *Stamens* 1-1.3 in. long, very slender, red-tinged. *Pod* 4-5 by .5-.7 in., thin, of a uniform light-brown colour, 8-10-seeded, often rugose over the seeds.

I follow Col. Prain in thinking that there are two distinct varieties of this species. The type with large stipules is found in JAUN SAR and TEHRI-GARHWAL up to 4,000 ft., e.g., at Thadiar, and the other,—var. *Smithiana*, Roxb.,—with smaller stipules; ie what is found near swamps in the Dún, e.g., Kálimatti, Káluwála;

banks of the Ré nadi, Sidharwála, etc. Vern. *Kaunerá*, Garhwal; *Bhandir*, Hind.

Sapwood large, white; heartwood reddish-brown; weight varying from 25 to 45 lbs. per c.ft., the typical variety being probably the heavier of the two. The wood is likely to be found suitable for tea-boxes. The tree yields a gum which "is used by the Nepalese for sizing their Daphne paper."—*Mr. J. S. Gamble*. The branches are lopped for fodder.

New leaves Feb., Mar., Fl. April-June. Fr. Autumn.

A. lucida, Benth., Fl. Br. Ind. ii. 299, is a graceful tree with dark-green foliage. It is not indigenous within the range of this Flora, but deserves mention as it grows well under cultivation at DEHRA, and is a good tree for avenues. It differs from all other species by having large penninerved acuminate leaflets, 3-5 in. long and 2-3 in. broad. *Flowers* sessile. *Pod* about 6 by 1 in., thin, flexible.

Pithecolobium dulce, Benth.; Fl. Br. Ind. ii. 302.

A middle-sized tree, armed with stipular spines pointing upwards. *Leaves* bipinnate; pinnae and leaflets one pair. *Flowers* white, in small globose, shortly peduncled heads arranged on elongated branches in panicles. *Stamens* monadelphous. *Pod* 4-5 in. long by .5 in. broad, 6-8-seeded, both sutures indented between the seeds, which are half enveloped in a pinkish pulpy edible aril. Planted and self-sown near Mohand and probably at other places also.

XXXIV. ROSACEÆ.

Herbs, shrubs or trees. *Leaves* stipulate, usually alternate, simple or compound. *Flowers* regular, 2-sexual. *Calyx* gamosepalous, superior or inferior. *Disk* annular or lining the base of the calyx-tube. *Petals* usually 5, imbricate. *Stamens* perigynous, usually indefinite, in one or many series, incurved in bud; anthers small. *Ovary* superior or inferior, of one or more free or connate carpels; styles as many as the carpels, free or connate. *Fruit* a pome, a drupe, or an

aggregate of drupes, achenes or follicles, rarely baccate or capsular. *Seeds* erect or pendulous, without albumen.

Analysis of the Genera.

Ripe carpels not enclosed within the calyx-tube, *i.e.*, calyx always inferior.

Leaves simple; carpel solitary; fruit a simple drupe.

Style terminal; branches unarmed . . . 1. PRUNUS.

Style basal; branches spinous . . . 2. PRINSEPIA.

Leaves generally simple; carpels few; fruit an aggregate of follicles . . . 3. SPIRÆA.

Leaves usually compound; carpels many. Calyx ebracteolate, fruit usually fleshy . . . 4. RUBUS.

Calyx bracteolate; fruit dry . . . 5. POTENTILLA.

Ripe carpels more or less enclosed within the calyx-tube, *i.e.*, calyx at least ultimately superior.

Stipules adnate to the petiole.

(Fruit an aggregate of achenes enclosed in a fleshy calyx) . . . 6. ROSA.

Stipules free, deciduous.

Fruit a pome; leaves simple, rarely pinnate . . . 7. PYRUS.

Fruit a drupe with 1-5 bony stones; leaves always simple.

Leaves toothed or serrate . . . 8. CRATÆGUS.

Leaves quite entire . . . 9. COTONEASTER.

1. **Prunus**, Linn.

Shrubs or trees. *Leaves* alternate simple, usually serrate or crenate, convolute or conduplicate in bud; petiole often with 2 glands. *Flowers* white or red, solitary fascicled corymbose or racemed. *Petals* 5. *Stamens* many, perigynous, free. *Carpel* 1; style terminal; ovules 2, pendulous. *Fruit* a drupe, with a smooth or rugged 1-seeded stone.

Analysis of the Species.

Flowers long-pedicelled in umbellate fascicles, appearing before the leaves . . . 1. *P. cerasoides*.

Flowers short-pedicelled in long nodding racemes, appearing after the leaves . . . 2. *P. cornuta*.

1. ***P. cerasoides***, D. Don.; Syn.—*P. Puddum*, Roxb.; Fl. Br. Ind. ii. 314; Brandis For. Flora 194, Ind. Trees 279; Gamble Man. Ind. Timb. 313. Vern. *Phājā*, Jaunsar; *Padam*, Hind.

A moderate-sized tree; bark brownish-grey, smooth, peeling off in thin shining horizontal strips. *Leaves* 3-5 by 1-1.5 in., ovate-lanceolate, long-acuminate, closely doubly-serrate, glabrous, shining, conduplicate in bud, appearing after the leaves; petiole about .5 in. long, with 2-4 glands at the base; *stipules* .6-.8 in. long, feathery and glandular. *Flowers* about .8 in. across, at first rose-coloured fading to nearly white; peduncles .5-1.5 in., in umbellate fascicles. *Calyx* glabrous; tube .3-.4 in. long, funnel-shaped; lobes acute, entire. *Petals* about .5 in. long, obovate or oblong. *Stigma* 3-lobed. *Fruit* .5-.7 in., ovoid, obtuse at both ends, acid, yellow or red; stone rugose and furrowed.

JAUNSAR, TEHRI-GARHWAL and the OUTER HIMALAYA up to 8,000 ft., mostly in the outskirts of villages, apparently cultivated or run wild.—Korwā, Koti-Bāwar, Bodayār; Mālkōt Forest, etc. Also cultivated in DEHRA.

Heartwood reddish, moderately hard, strong, durable, with a pleasant smell; weight 40-45 lbs. per c.ft. The branches with the shining bark on are used for walking-sticks. The fruit is eaten, and the stones are strung up in rosaries and necklaces used by faqirs.

New leaves May, June. Fl. April, May, and sometimes also in autumn. Fr. Two months after flowering

2. ***P. cornuta***, Wall.; Syn.—*P. Padus*, Hook. f. Fl. Br. Ind. ii. 315 (non Linn.); Brandis For. Flora 194, Ind. Trees 280; Gamble Man. Ind. Timb. 314. The Bird Cherry. Vern. *Jāmoi*, *Jāmroi*, *Jāmmoi*, Jaunsar.

A moderate-sized tree; bark rough, dark-grey or brown; young parts and inflorescence softly pubescent. *Leaves* 4-6 by 1-2.5 in., oblong elliptic or lanceolate, acuminate, closely serrate, often slightly cordate, conduplicate in bud, turning red before falling; lateral nerves 12-15 pairs, red and hairy at the axils underneath; midrib and petiole red, stout, the latter 1-1.5 in. long, with a pair of glands near the apex; bud scales 1.5 by .25 in., reddish brown,

Flowers .2-.3 in. diam., white, in many-flowered nodding axillary and terminal racemes which are 4-6 in long; pedicels .25 in. *Calyx* turbinate, about .1 in. long. *Petals* white, .15 in. long, round, concave. *Drupe* acid, about .4 in. diam., globose, somewhat compressed, red when half ripe, almost black when fully ripe; stone rugged.

Common in JAUNSAIR and TEHRIGARHWAL, 6-9,000 ft.—Deoban, Konain, Bhujkōti, Mundali; Deotā, etc., characteristic of grazing grounds. Scarce in the outer ranges.

Wood brownish-white, close and even-grained; weight about 40 lbs. per c.ft. It takes a fine polish, but is seldom used. The acid fruit is eaten by the hill people. The leaves are lopped for fodder.

New leaves April. Fl. April-June Fr. July-Oct.

To this Genus belong the following well-known fruit trees, the cultivation of which is gradually extending in the HILLS:—

1. *P. persica*, Benth. & Hook, f.; Fl. Br. Ind. ii. 313. The Peach. Vern. *Frū*, Hind. *Leaves* 3-5 by 7-1.3 in., oblong-lanceolate, serrate. *Flowers* about 1 in. across, pink, sessile. *Fruit* about 1.5 in. long; stone deeply furrowed. Now found in a semi-wild state in most parts of the DŪN. Cultivated throughout the HILLS.

2. *P. armeniaca*, Linn.; Fl. Br. Ind. ii. 313. The Apricot. Vern. *Chūlū*, *Chilu*, Hills; *Zardālu*, Hind. *Leaves* 2-3.5 in. diam., broad-ovate, acuminate, crenate; petiole 1-1.5 in. long, flexible, glandular. *Flowers* about .8 in. across, white or pinkish. *Fruit* about 1 in. long; stone smooth. Cultivated in the HILLS and also in DEHRA.

3. *P. Cerasus*, Linn.; Fl. Br. Ind. ii. 313.—The Cherry. *Leaves* 2-3 by 1-1.2 in., ovate, elliptic, abruptly acuminate, crenate, serrate. *Flowers* white, on long slender peduncles, in fascicles of 2-5. *Drupe* .4-.5 in. diam., globose, smooth and shining; stone round, smooth. Cultivated in the HILLS.

4. *P. communis*, Hudson, var. *insititia*; Fl. Br. Ind. ii. 315. The Plum. Vern. *Alūcha*, *Ālū-bukhāra*, Hind. *Leaves* 3-4 in. long, ovate-lanceolate, serrate; nerves pubescent beneath. *Flowers* white or pink, on long slender peduncles. *Drupe* smooth globose or oblong. Cultivated in the HILLS, and some varieties are grown in DEHRA and also in the PLAINS.

2. *Prinsepia*, Royle.

1. *P. utilis*, Royle; Fl. Br. Ind. ii. 323; Brandis For. Flora 196, Ind. Trees 281; Gamble Man. Ind. Timb. 316. Vern. *Bhekoi*, *Bhek*. Jaunsar; *Bhekal*, *Bhelar*, Garhwal.

A dark-green spinous shrub; bark green on branches, brownish white and peeling off in vertical strips on the main stem; spines often leaf-bearing. *Leaves* alternate, simple, 1.5-5 by .5-1.2 in., elliptic or narrow-lanceolate, acuminate, entire or sharply serrate, coriaceous dark-green, glabrous; petiole .2-.5 in. long. *Flowers* white, .3-.4 in. across, in short axillary racemes. *Calyx* cup-shaped, persistent. *Petals* 5, shortly clawed. *Stamens* numerous, in many series; filaments short; anther-cells separating by a broad connective. *Carpel* 1; style basal; ovules 2, pendulous. *Drupe* .5-.7 in. long, obliquely obovate or oblong, with the remains of the style near the base, deep-purple and pruinose when ripe; kernel coriaceous, 1-seeded, smooth; cotyledons oily.

JAUNSAR 4,-8,000 ft.; common in sunny open places.—Saiá, Korwá, Matkángar, Konáin, Koti-Báwar, etc.

Heartwood red, very hard, compact, but much liable to split; weight 69 lbs per c.ft. An oil is expressed from the seeds which is used chiefly for burning.

Fl. April, May. Fr. Rainy season.

3. *Spiræa*, Linn.

Perennial herbs or shrubs. *Leaves* alternate, simple or compound. *Flowers* white or red, in axillary or terminal cymes. *Calyx* persistent; lobes 4-5. *Petals* as many as the calyx-lobes. *Stamens* many; filaments free or connate below. *Disk* fleshy. *Carpels* 5 or more, free or connate below; ovules 2 or more, pendulous. *Fruit* an aggregate of 5 or more follicular carpels.

Analysis of the Species.

Leaves pinnate; carpels connate below . . . 1. *S. Lindleyana*.

Leaves simple; carpels quite free.

Branches slender; leaves glaucous beneath; flowers dimorphous . . . 2. *S. bella*.

Branches stout; leaves pale beneath; flowers not dimorphous . . . 3. *S. canescens*.

1. **S. Lindleyana**, Wall.; Syn — *S. sorbifolia*, Linn.; Fl. Br. Ind. ii. 324; Brandis Ind. Trees 283; Gamble Man. Ind. Timb. 316. Vern. *Lotkár, Lotkár*; Jaunsar.

A tall shrub; bark reddish-grey. *Leaves* imparipinnate, less frequently paripinnate, 8-12 in. long; rachis terete. *Leaflets* 6-10 pairs, sessile, 3-5 by 7-1 in., linear-lanceolate, rounded at the base, long acuminate, doubly serrate, glabrous or hairy beneath; midrib stout; lateral nerves numerous, straight; stipules linear-subulate, .25 in. long. *Flowers* white, .25 in. diam., in many-flowered cymes which are disposed in large thyrsoid much-branched terminal panicles 1-1.5 ft. long. *Calyx-tube* hemispherical; lobes rounded. *Petals* orbicular. *Carpels* 5, connate below, separating and dehiscing dorsally in fruit.

JAUN SAR and TEHRI-GARHWAL, 7,9,000 ft.; common at Konáin. Also found at Mundáli; Deotá, etc.

Wood hard, compact, even-grained; weight 49 lbs. per c.ft.
Fl. May, June. Fr. June, July.

2. **S. bella**, Sims.; Fl. Br. Ind. ii. 324; Brandis Ind. Trees 283.

A small shrub 2-6 ft. high. *Leaves* simple, very variable in size and shape, .5-2 in. long, broadly oblong ovate or ovate-lanceolate, obtusely inciso-serrate throughout or towards the apex only, membranous, dark-green above, glaucous beneath. *Flowers* generally pink, dimorphous and subdioecious, in corymbosely much-branched cymes. *Calyx-tube* villous within; lobes acute. *Petals* orbicular. *Stamens* deformed in the female flowers, long in the male. *Style* long in the female flowers, short in the male. *Ripe carpels* dark-brown, shining.

TEHRI-GARHWAL, e.g., Deotá, etc.; not very common.
Fl. April, May. Fr. Oct., Nov.

3. **S. canescens**, Don; Fl. Br. Ind. ii. 325; Brandis Ind. Trees 283; Gamble Man. Ind. Timb. 317. Vern. *Tákoi, Chakroi*, Jaunsar.

A stiff small shrub; branches striate, grey-canescant, arching. *Leaves* simple, .4-8 by .3-5 in., obovate, entire or toothed towards the apex on luxuriant shoots, subcoriaceous, pale-green beneath; lateral nerves 2-4 pairs; petiole up to .15 in. *Flowers* hermaphrodite, bracteate, white or pale-pink, .2 in. diam., in small dense compound corymbs at the ends of all the branches and branchlets. *Stamens* not longer than the petals. *Ripe carpels* villous, partially sunken in the calyx-tube.

JAUN SAR and TEHRI-GARHWAL, above 7,000 ft., chiefly on open hill sides. Quite common.

Wood fairly hard, even and close-grained; weight 47 lbs. per c.ft. Light walking-sticks are made of the branches.

Fl. May-July. Fr. Autumn.

S. vacciniifolia, Don.; Fl. Br. Ind. ii. 325; occurs in the HILLS below 7,000 ft.—Bámsu Valley, valleys below Konáin, Málköt, etc. It is very similar in appearance to *S. bella*, but is more gregarious in habit, and the flowers are hermaphrodite and white.

Spiræa corymbosa, Roxb.—A shrub with white flowers in umbelliform corymbs on slender pedicels is often cultivated in gardens.

4. *Rubus*, Linn.

The Brambles.

Usually trailing shrubs, almost always prickly. *Leaves* (on the local species) generally compound, stipules more or less adnate to the petiole. *Flowers* white or red, in terminal or axillary corymbose panicles, rarely solitary. *Calyx* 5-lobed, persistent. *Petals* 5. *Stamens* numerous. Carpels many, distinct, on a convex receptacle; style subterminal. *Fruit* of many 1-seeded drupes crowded on the receptacle which becomes conical in the fruit.

Analysis of the Species.

Leaves simple; petals white; fruit black . . . 1. *R. paniculatus*.

Leaves pinnately 3-rarely 5-foliolate.

Petals pink; fruit red, generally dry . . . 2. *R. niveus*.

Petals white; fruit yellow, succulent.

Leaflets glabrous, stems without bristles . . . 3. *R. macilentus*.

Leaflets beneath and stems bristly . . . 5. *R. fasciculatus*.

Leaflets tomentose or pubescent beneath.

Stem bristly; flowers in dense-flowered terminal panicles . . . 4. *R. ellipticus*.

Stem quite glabrous, pruinose; flowers in 1-3-flowered axillary peduncles . . . 6. *R. biflorus*.

Leaves pinnately 5-11-foliolate; petals pink; fruit black . . . 7. *R. lasiocarpus*.]

1. **R. paniculatus**, Smith ; Fl. Br. Ind. ii. 329 ; Brandis. For. Flora 196, Ind. Trees 283 ; Gamble Man. Ind. Timb. 318. Vern. *Pándroi*, *Kálá Anchhu*, Jaunsar.

A large rambling shrub ; all parts except the upper surface of the leaves clothed with soft white cottony tomentum ; prickles few, minute. *Leaves* 3-6 by 2·5-3·5 in., ovate, cordate, long-secuminate, obscurely lobed, irregularly serrate, 3-5-nerved at the base ; lateral nerves about 8 pairs ; petiole 1-2 in. long. *Flowers* 7-1 in. diam., in much-branched lax terminal panicles which are 4-12 in. long ; pedicels 5-1 in. long. *Calyx-lobes* ovate-lanceolate, often caudate-acuminate, erect in fruit. *Petals* 2-3 in. long, much shorter than the calyx-lobes. *Carpels* glabrous. Fruit 5-7 long, conical black ; drupes large ; receptacle villous.

JAUNSAR and TEHRI-GARHWAL, up to 6,000 ft. Generally in damp shady ravines : Korwá, Dhárágádh, Bagúr Block, Kōti, Tons Valley, etc.

The fruit is good to eat.

Fl. April-June. Fr. June, July.

2. **R. niveus**, Wall. ; Fl. Br. Ind. ii. 335 ; Brandis For. Flora 199 ; Gamble Man. Ind. Timb. 317. Vern. *Bheré*, *Bherá*, *Bheare*, Jaunsar.

A very variable shrub, rambling or suberect ; branches usually glabrous. *Leaves* pinnately 3-foliolate, rarely 5-foliolate, 3-6 in. long ; petiole with several prickles beneath. *Leaflets* 1-4 by 8-3 in., ovate or elliptic, often cordate, lobed or incised, generally doubly serrate, membranous. *Flowers* 3-7 in. diam., axillary or in few-flowered corymbose terminal cymes ; pedicels 2-8 in. long. *Calyx-segments* 3-4 in. long, ovate-lanceolate, pubescent, spreading or reflexed in fruit. *Petals* pink, 2-3 in diam., broad-ovate, much smaller than the calyx-lobes, erect, concealing the stamens. *Stamens* very numerous. *Fruit* globose ; drupes many, dry, not edible, less frequently few, fleshy, very acid.

Gregarious in JAUNSAR and TEHRI-GARHWAL, 7,-10,000 ft. ; extremely common.

It interferes with the reproduction of tree species on shady northern aspects as in the Mundáli Forest, but in other places is useful as a shade-giver to young plants of delicate species.

Fl. April, May. Fr. May, June.

3. **R. macilentus**, Camb. ; Fl. Br. Ind. ii. 336 ; Brandis For. Flora 199. Ind. Trees 286.

A trailing shrub, deep-green all over; stem nearly glabrous, shining; prickles flattened. *Leaves* pinnately 3-foliolate; rachis 3-4 in. long. *Leaflets* 5-2.5 in. long, ovate or ovate-lanceolate, doubly crenate-toothed, subcoriaceous, glabrous, prickly along the midrib, —the lateral very variable in size and shape. *Flowers* 3-6 in. across; peduncles 2-8 in. long, pubescent, generally 1-flowered, axillary and terminal. *Calyx-lobes* caudate, erect in fruit, silky outside, tomentose within. *Petals* white, broad-obovate, clawed, exceeding the sepals. *Fruit* globose, yellow or deep-orange; drupes few, glabrous, juicy; receptacle elongated, pubescent.

Common in JAUNSAK and TEHRI-GARHWAL, up to 8,000 ft.—*Chakrata*, Jādi, Konāin, Mundali; Deota, etc.

The fruit is eaten.

Fl. April, May. Fr. June, July.

4. *R. ellipticus*, Sm.; Fl. Br. Ind. II. 536. Brandis Ind. Trees 286; Gamble Man. Ind. Timb. 317. Syn. —*R. flavus*, Ham.; Brandis For. Flora 197. Vern. *Hinsālu*, Jaunsar; *Hinsar*, Garhwal; *Ānchhu*, *Lāl Ānchhu*, Hind.

A large shrub; branches stout, shaggy with long reddish bristles, often also with glandular hairs; prickles sharp. *Leaves* pinnately 3-foliolate, the lower ones sometimes 1-foliolate; rachis 1-3 in. long. *Leaflets* 2-4 in. long, obovate elliptic or orbicular, closely serrate, dark-green above, pale-green and usually tomentose beneath. *Flowers* 3-6 in. across. *Calyx-segments* ovate, erect in fruit. *Petals* white, obovate, exceeding the calyx-segments. *Fruit* 3-6 in. diam.; yellow; drupes small, crowded; receptacle cylindrical, hairy.

JAUNSAK and TEHRI-GARHWAL, 3-5,000 ft.; common on open hill-sides and round villages; Saia, Binālgadh, Dhārāgādh, Kōti Bāwar, Tons Valley, etc. Also OUTER HIMALAYA and the DŪN: —Mālkōt, Thāno, Raipur, etc.

The fruit has an agreeable flavour, and is greedily eaten, wherever the plant grows.

Fl. Feb., Mar. Fr. April, May.

5. *R. fasciculatus*, Duthie: Ann. Bot. Gard. Calc. IX, p. 29. t. 48; Brandis Ind. Trees 286.

A sarmentose shrub; stems downy, clothed with long reddish-brown spreading bristles. *Leaves* 3-foliolate; *petiole* .75-1.25 in. long, bristly; *stipules* subulate; *leaflets* broadly elliptic, ovate or obovate, more or less abruptly acuminate, doubly serrate, thin, cartilaginous, dark-green above, slightly paler beneath, glabrous on both surfaces except for the bristles on midrib and veins beneath:

veins 8-10 pairs, impressed above and prominent beneath; *terminal leaflets* 3-4·5 in. long, by 2-4 in. broad, the lateral pair, much smaller than the terminal. *Flowers* in dense terminal and axillary clusters, rarely solitary in the axils of leaves. *Calyx* velvety pubescent on both sides, more or less bristly outside; *lobes* ·25 in. long, ovate, mucronate. *Petals* about as long as the sepals, spathulate, white. *Fruit* globose, golden-yellow.

Damp shady ravines in the Tons valley, in Tehri Garhwal, 5,000 ft.; Chakrata; Mussoorie; in similar situations.

Fl. Mar., April. Fr. June, July.

6. **R. biflorus**, Hem. : Fl. Br. Ind. ii. 338, *R. biflorus*, Buch.; Brandis For. Flora 198, Ind. Trees 286; Gamble Man. Ind. Timb. 317. Vern. *Āchhou*, Jaunsar.

A large spreading shrub; branches glabrous, white with a glaucous bloom; prickles sharp and strong. *Leaves* usually 3-foliate, sometimes 5-foliate, rarely 1-foliate and 3-lobed; petiole 1-2 in., pubescent, prickly. *Leaflets* 2-3·5 in. long, ovate-lanceolate, often obscurely lobed, irregularly doubly-serrate or toothed, hairy above, white and densely tomentose beneath. *Flowers* ·5-·7 in. diam.; peduncles axillary, slender, drooping, ·5-1·5 in. long, 1-3-flowered. *Calyx-lobes* ovate-lanceolate, mucronate. *Petals* white, orbicular, equal to, or exceeding the calyx-lobes. *Fruit* ·6-·7 in. diam., globose, yellow; drupes 20-30, juicy; receptacle elongated, villous.

JAUNSAR, up to 8,000 ft.: Bodyār, Kathiān, Dhārāgādh, etc. Less common than any of the preceding species.

The fruit has a sweetish taste and is eaten.

Fl. April, May. Fr. May, June.

7. **R. lasiocarpus**, Sm. ; Fl. Br. Ind. ii. 339; Brandis For. Flora 198, Ind. Trees 286; Gamble Man. Ind. Timb. 317. Vern. *Bheré*, *Kálá Hinsálu*, Jaunsar; *Káli Ānchhi*, Dún.

A spreading shrub, often gregarious; branches long, thickly pruinose, purple below the bloom, quite glabrous. *Leaves* 5-7 foliolate, rarely 11-foliate, 3-10 in. long. *Leaflets* 1-3 in. long, ovate elliptic or ovate-lanceolate, acutely toothed or serrate, subcoriaceous, glabrous or silky above, thickly white-tomentose beneath, terminal often lobed; lateral nerves close, straight, very strong beneath. *Flowers* ·3-·7 in. diam., in terminal and axillary simple or panicle lax corymbs; peduncles 1-2 in. long; pedicels of various lengths. *Calyx* densely woolly; lobes ovate or ovate-lanceolate. *Petals* red, round or obovate, usually shorter than the calyx-lobes. *Fruit*

·3-5 in. diam., black when fully ripe, dry or fleshy ; drupes numerous ; receptacle villous.

Fairly common in the DÚN and the OUTER HIMALAYA : Karwápani, Rámgarh, Tháno, Málkôt, etc. Also found in JAUNSAH up to 7,000 ft., e.g., Lúrlí forest, Kathián, etc.

The fruit has a good flavour and is eaten.

Fl. April, May in the Hills ; Feb., Mar. in the Dún. Fr. —About two months after flowering.

5. *Potentilla*, Linn.

P. rigida, Wall. ; Syn.—*P. fruticosa*, Linn. ; Fl. Br. Ind. ii. 347 (in part).

A much branched, low, rigid under-shrub, twigs very silky when young, older stems stout, the bark peeling off in papery rolls. *Leaves* usually 3 foliate, crowded ; *leaflets* ·4-7 in. long by ·15-25 in. broad, elliptic-oblongate, entire, acute, adpressed silky-hairy on both surfaces ultimately glabrescent beneath ; *stipules* ·3-5 in. long, brown, membranous. *Flowers* bright yellow, ·75-1·5 in. diameter, usually solitary ; *peduncles* up to 1 in. long, silky. *Bracteoles* 10, in pairs between the calyx-lobes, oblong, as long as the calyx-lobes, silky on both surfaces. *Calyx* persistent, 5-lobed *lobes* ovate, cuspidate, silky outside glabrous within. *Petals* 5, obovate, twice as long as the calyx-lobes. *Stamens* numerous, connective of the anthers prominent. *Achenes* numerous, minute hairy.

Jaunsar and Tehri-Garhwal, 8-12,000 ft. Pandawa, Rikhsin, Balcha, etc.

Fl. July-Sept.

6. *Rosa*, Linn.

Erect scrambling or climbing shrubs, more or less prickly. *Leaves* alternate, imparipinnate ; leaflets serrate ; stipules more or less adnate to the petiole. *Inflorescence* various. *Flowers* white, yellow or pink. *Calyx-tube* globose, ovoid or pitcher-shaped ; mouth contracted ; segments foliaceous. *Disk* coating the calyx, tube silky. *Petals* 5, rarely 4. *Stamens* numerous.

inserted on the edge of the disk. *Carpels* 1-ovuled, hairy, usually many, enclosed in the calyx-tube; styles free or connate above the neck of the calyx-tube; stigma thickened; ovule pendulous. *Fruit* an aggregate of 1-seeded dry hairy achenes enclosed in the fleshy calyx-tube.

Analysis of the Species.

Suberect shrubs. Styles distinct; sepals persistent in fruit.

Leaflets serrate nearly down to the base;

flowers bracteate; petals 5 . . . 1. *R. macrophylla*.

Leaflets toothed only in the upper half;

flowers ebracteate; petals usually 4 . . . 2. *R. sericea*.

A large climber. Styles united into an exserted column; sepals deciduous in fruit

3. *R. moschata*.

1. *R. macrophylla*, Lindl.; Fl. Br. Ind. ii. 366; Brandis For. Flora 203, Ind. Trees 288; Gamble Man. Ind. Timb. 319. Vern. *Bhāunra Kujoi*, Jaunsar.

An erect shrub, 6-10 ft. high, with smooth green branches; bark of stem dark-brown, peeling off in thick flakes; prickles more or less straight, often 0. *Leaves* 3-8 in. long; petiole pubescent, slightly channelled above; stipules 4-6 in. long, spreading, ciliate with glands. *Leaflets* 7-11, 5-2.5 by 3-1.3 in., gradually smaller from the terminal downwards, elliptic, usually grey-pubescent beneath, minutely petioled. *Flowers* 1-2.5 in. diam., bright-red or pink, solitary or in few-flowered subterminal corymbs; pedicels 5-1.5 in. long, studded with glandular bristles. *Bracts* 1-1.5 in. long, lanceolate, leaf-like, glandular on the margins. *Calyx* with glandular bristles outside; lobes much elongated, filiform in the middle, dilated and leafy above, persistent in fruit. *Petals* 5, broadly obovate. *Styles* hairy, exserted. *Fruit* 1-2 in. long, turbinate

Common in the HILLS, 7-10,000 ft.; almost gregarious in some forests e.g., Mohmā Block, Mundāli, Konāin, Deota, etc., where it often interferes with the natural reproduction of tree species.

Wood hard, compact, weighing 55-60 lbs. per c. ft. It makes good hedges. The fruit is eaten when ripe.

Fl. May, June. Fr. July, Aug.

Var. *minor*, Lindl.—has leaflets up to .5 in. long and somewhat smaller flowers.

2. **R. sericea**, Lindl.; Fl. Br. Ind. ii. 367; Brandis For. Flora 202, Ind. Trees 288; Gamble Man. Ind. Timb. 319.

A suberect thorny shrub, 4-8 ft. high; bark greyish brown, peeling off in papery flakes; prickles nearly straight, brown. *Leaves* 1-3 in. long; stipules oblong, spreading, membranous. *Leaflets* 7-11, .25-1 in. long, oblong or obovate-oblong, dentate or coarsely serrate in the upper half, glabrous above, silky along the nerves beneath. *Flowers* 1.5-2.5 in. diam., solitary, white or pink; peduncle and calyx-tube glabrous; bracts 0. *Calyx-lobes* lanceolate, pubescent, persistent in fruit. *Petals* usually 4, .6-1.2 in. long, obovate, pure white or with a shade of pink. *Fruit* pyriform, scarlet.

TEHRI-GARHWAL, above 9,000 ft.: Deotā (Rikshin), Bálchá, Harki-Dún, etc. Likely also to occur at higher elevations in JAUN-SAR.

Fl. May-July.

3. **R. moschata**, Mill.; Fl. Br. Ind. ii. 367; Brandis For. Flora 201, Ind. Trees 288; Gamble Man. Ind. Timb. 318. Vern. *Kájoi*, Jaunsar; *Kúnjo*, Garhwal.

A large thorny climbing shrub; bark greyish-brown; prickles stout, recurved. *Leaves* 2-6 in. long; petiole pubescent, slightly channelled, with scattered prickles beneath; stipules about 1 in. long, membranous, with a spreading tip and a few glandular hairs along the margins. *Leaflets* 5-9, 1-3 by .4-1.3 in., ovate, ovate-lanceolate or elliptic, acuminate, very regularly closely serrate, finely grey-pubescent beneath, lateral subsessile. *Flowers* sweet-scented, 1.5-2 in. diam., in large terminal corymbose racemes; pedicels 1-1.5 in. long, slender, grey-pubescent and also with a few scattered red glands. *Calyx-lobes* about 1 in. long, narrow-lanceolate, often with 1-2 pairs of foliaceous appendages at the margins, deciduous in fruit. *Petals* 5, pure white, obovate, generally with a distinct tip. *Stamens* yellow, much shorter than the petals. *Styles* exserted, united into a hairy column above the neck of the calyx-tube. *Fruit* .3-.4 in. long, obovoid, dark-brown.

Common in JAUN-SAR and TEHRI-GARHWAL, 3,000 to 8,000 ft., also in the OUTER HIMALAYA, generally along streams or in open ravines: Korwá, Konáin, Dhárágádh, Kathián, Tons Valley; Láduakót, etc.

Often injures forest trees by spreading over their crowns. An excellent otto is extracted from the flowers at Náhan in SIAMMOOR.

Fl. May, June. Fr. June, July.

Rosa multiflora, Thunb.; Fl. Br. Ind. ii 364. A climbing rose with double pink flowers in corymbose clusters; *stipules* and *bracts* pectinate, *petioles* and *inflorescence* hairy. Common in roadside hedges throughout the Dun. It is native of China and Japan. Fl. April, May.

7. *Pyrus*, Linn.

Trees or shrubs. *Leaves* alternate, generally simple, rarely pinnate: *stipules* deciduous. *Flowers* white or pink, in terminal corymbs. *Calyx-tube* urceolate or turbinate; lobes erect or reflexed, persistent or deciduous. *Petals* 5. *Stamens* many; filaments sometimes connate at the base. *Carpels* 2-5, adnate to the calyx-tube; ovules usually 2 in each carpel; styles 2-5, free or connate below. *Fruit* a pome, 2-5-celled, more or less fleshy.

Analysis of the Species.

Leaves simple.

Leaves glabrous, green beneath . . . 1. *P. Pashia*.

Leaves always white-woolly beneath . . . 2. *P. lanata*.

Leaves pinnate, (rusty-tomentose beneath) . . . 3. *P. foliolosa*.

1. *P. Pashia*, Ham.; Fl. Br. Ind. ii. 374; Brandis For. Flora 575. Ind. Trees 291; Gamble Man. Ind. Timb. 322. Syn.—*P. variolosa*, Wall.; Brandis For. Flora 204. Vern *Kaint*, *Kaenth*, *Jaunsar*; *Mohal*, *Mehal*, *Meyel*, *Mahol*, Dún and Garhwal.

A moderate-sized deciduous tree; bark on old stems almost black, both longitudinally and transversely split into small thick rectangular scales, on branches dark-brown smooth and with small white lenticel-dots. *Leaves* simple, very variable in size and shape, generally 2-4 by 1-1.5 in., ovate or ovate-lanceolate, long-acuminate, closely serrate or crenate, glabrous, shining, lobed and often woolly beneath on young plants; lateral nerves 8-10 pairs, very slender, more prominent above than beneath; petiole 1-1.5 in. long, slender, often reddish; stipules 1 in. long, setaceous, early deciduous. *Inflorescence* a corymb or an umbel,—or the flowers are fasciated at the ends of short branchlets,—appearing shortly before the leaves;

pedicels .5-2 in. long, thickened in fruit. *Flowers* white, about 1 in. across. *Calyx-tube* urceolate; lobes spreading, white-woolly. *Petals* obovate, with dark radiating veins. *Stamens* 25-30. *Styles* 3-5, woolly. *Fruit* globose, .7-1.5 in. diam., dark-brown, covered with raised white dots.

Common in JAUNSAK and TEHRI-GARHWAL up to 7,500 ft. : Chakrata, Koti-Kanisar, Konáin, Dhārāgádh, Kathián, etc. Also found in the OUTER HIMALAYA and in certain localities in the Dún : Málkót, Paléd, Tháno, Mothronwála, Bindal-nálá near Dehra, etc.

Wood brown, compact, fine-grained, hard and durable, but liable to split and warp in seasoning; weight 47 lbs. per c. ft. It is used for walking-sticks, combs, tobacco-pipes and such other purposes. The fruit is eaten when half-rotten. The leaves and twigs are lopped for fodder.

New leaves and flowers Mar., April in the hills, and about a month earlier in the Dún. Fr. Sept.-Dec.

2. *P. lanata*, Don; Fl. Br. Ind. ii. 375; Gamble Man. Ind. Timb. 323; Brandis Ind. Trees 291; Syn. — *P. Aria*, Ehrh.; Brandis For. Flora 206. Vern. *Pái*, *Páthi*, Jaunsar.

A moderate-sized deciduous tree; bark dark-brown with shallow longitudinal furrows. *Leaves* simple, 5-8 by 2-4 in., broadly oblong or obovate, acute, lobulate, finely serrate, white-woolly beneath, glabrescent above; lateral nerves 8-12 pairs, nearly straight, very prominent beneath; base rounded or acute; petiole .5-1 in. long. *Flowers* white, .4-.6 in. diam., in short hemispherical corymbs, 3-5 in. across; pedicels short, woolly. *Calyx* turbinate; lobes ovate, acute. *Petals* obovate-oblanccolate, shortly clawed. *Stamens* 20. *Styles* 2-3, villous. *Fruit* .5-1 in. long, pyriform, and 1-2 seeded (in the region of this Flora.)

JAUNSAK and TEHRI-GARHWAL, above 8,000 ft., characteristic of the high-level grazing grounds. Konáin. Mundáli; Deotá, Bálcá, etc.

Wood close- and even-grained, "might be used for boxes and other purposes."—*Mr. J. S. Gamble*. Weight 40-47 lbs. per c. ft. The fruit is eaten when half-rotten.

Fl April, May. Fr. Aug.-O .

3. *P. foliolosa*, Wall.; Fl. Br. Ind. ii. 376; Gamble Man. Ind. Timb. 323; Brandis Ind. Trees 292. Syn. *P. ursina*, Wall.; Brandis For. Flora 206.

A shrub or small tree; bark reddish-grey, peeling off in horizontal papery strips. *Leaves* imparipinnate, 4-6 in. long rusty-

tomentose at first, glabrate afterwards. *Leaflets* 9-15 pairs, opposite, sessile, 1-1.5 in. long, the middle ones longer than the others, linear-oblong, acute or obtuse, cuspidate-serrate. *Flowers* greenish-white, 3-5 in. diam., in compound terminal and axillary corymbs; pedicels short, glabrous; bracts rusty-hairy. *Calyx* cup-shaped, glabrous; segments triangular. *Petals* orbicular-ovate, rusty-villous. *Styles* thick, short. *Fruit* 3-5 in. diam., ovoid or globose, bluish-red when ripe.

JAUNSAR and TEHRI-CARHWAL, above 7,000 ft.

Fl. June, July. Fr. Sept., Oct.

Two well-known fruit trees belong to this Genus :—

1. *P. Malus*, Linn.; Fl. Br. Ind. ii. 373. The Apple tree. Vern. *Sew*, Hind. *Leaves* 2-3 in. long, ovate, glabrous above, tomentose beneath, acuminate, crenate, long-petioled. *Flowers* pink-tinged, 1 in. diam. *Calyx-lobes* persistent. *Petals* clawed. *Pome* 2-3 in. diam., globose, intruded at both ends; seeds brown, lenticular. Cultivated at Chakrata. Fl. Mar.-May. Fr. Dec., Jan.

2. *P. communis*, Linn.; Fl. Br. Ind. ii. 374. The Pear tree. Vern. *Nāshpāti*, Hind. *Leaves* variable in size, oblong or ovate, acute, entire or slightly crenulate; petiole slender, very long. *Flowers* white, 1 in. diam. *Calyx-lobes* persistent. *Petals* obovate. *Pome* 1-2 in. diam. pyriform or sub-globose, intruded at the apex. Much cultivated in DEHRA. Fl. Mar., April. Fr. July-Sept.

8. Cratægus, Linn.

1. *C. crenulata*, Roxb.; Fl. Br. Ind. ii. 384; Gamble *Man Ind.* Timb. 325; Brandis *Ind. Trees* 294. Syn.—*C. Pyracantha*, Pers.; Brandis *For. Flora* 208. Vern. *Gingáru*, Jaunsar.

A large rigid spinescent evergreen shrub. *Leaves* alternate, simple, generally crowded on short lateral branchlets, 1-2.5 by .2-5 in., linear-oblong or oblanceolate, obtuse, very coriaceous, crenulate glabrous, shining above; lateral nerves close, parallel, indistinct, petiole very short, margined; stipules deciduous. *Flowers* white, .2-3 in. diam., in terminal corymbose cymes; pedicels slender; bracts caducous. *Calyx-tube* hemispherical; lobes obtuse. *Petals* orbicular, very shortly clawed, inserted at the mouth of the calyx-tube. *Stamens* many. *Carpels* 5, connate below; ovules 2 in each cell, ascending. *Fruit* a dry globose drupe, .2-3 in. diam., orange or red when ripe.

JAUN SAR and TEHRI-GARHWAL, ascending to 6,500 ft. generally along streams in open valleys: Korwā Forest, Binalgādh Dhārāgādh, Tons Valley, etc. Also along Sub-Himalayan mountain streams in the DŪN, e.g., Bidhālāna Rāu and Bindāl-nālā.

Wood white, hard, very close and even-grained; weight 48 lbs. per c.ft. The branches are made into walking-sticks and khud-sticks in the hills.

Fl. April, May. Fr. July, Aug.

9. *Cotoneaster*, Linn.

Shrubs or small trees. *Leaves* alternate, simple, entire, usually downy beneath; stipules deciduous. *Flowers* middle-sized, white or pink, solitary or in axillary or terminal corymbose cymes. *Calyx-tube* turbinate: segments 5, short, persistent. *Petals* 5. *Stamens* many, inserted at the mouth of the calyx-tube. *Carpels* 2-5, more or less adnate to the calyx-tube: ovules 2 in each cell, erect; styles 2-5, free. *Fruit* small, with 2-5 bony 1-seeded stones.

Analysis of the Species.

Erect shrubs. Leaves deciduous.

Flowers white, in many-flowered pedunculate cymes 1. *C. bacillaris*.

Flowers pink, in 3-10-flowered pedunculate cymes; leaves glabrous or nearly so 2. *C. rosea*.

Flowers in 1-5-flowered more or less sessile cymes; leaves pubescent . . . 3. *C. acuminata*.

A prostrate shrub. Leaves persistent . . . 4. *C. microphylla*.

1. *C. bacillaris*, Wall.; Fl. Br. Ind. ii. 384; Brandis For. Flora 208, Ind. Trees 294; Gamble Man. Ind. Timb. 326. Vern. *Rāuqsh*, *Ruīqsh*, *Leonsh*, Jaunsar.

A very variable shrub, usually 10-18 ft. high, but under favourable circumstances a small tree attaining a considerable girth (e.g., 9 ft. 6 in. at Bālcā)*: crown spreading; bark bluish-grey,

* Measured 3rd June 1900.

almost smooth, marked with short transverse white bars. *Leaves* 1.3-5 by .7-1.7 in., ovate, ovate-oblong, obovate or lanceolate, rather membranous, finely pubescent or glabrescent and pale beneath, often minutely mucronate; midrib very prominent beneath, depressed above; main lateral nerves 6-10 pairs; base acute; petiole .2-.4 in.; stipules .2-.3 in. long, subulate, early caducous. *Flowers* white, .25-.3 in. across, in spreading compound cymes at the end of short leaf-bearing branchlets. *Fruit* .2-.5 in. diam., globose, 2-celled, in spreading bunches, dark-brown when ripe.

JAUN SAR and TEHRI-GARHWAL, 4, -8,500 ft.; Deothát, Bodyár, Konáin, Mundáli: Deotá, Lambátáich, Bálichá, etc. Generally in open ravines and on grassy hill-sides.

Wood brownish-white, very hard, tough, close and even-grained; annual rings distinct; weight 57 lbs. per c. ft. The branches are much sought after for making walking-sticks; indeed no tree of any size is ever found which has not been repeatedly mutilated.

2. *C. rosea*, Edgew.; Brandis Ind. Trees 295; Syn.—*C. bacillaris*, Wall. Var. *affinis*; Fl. Br. Ind. ii. 385.

An erect deciduous shrub; branches slender, drooping, sparsely hairy when quite young. *Leaves* .5-2 in. long by .3-1 in. broad, elliptic, rounded or bluntly pointed, mucronate at the apex, thin, membranous, bright green above, pale and glaucous beneath, slightly hairy on the mid-rib above, more or less glabrous beneath; *petiole* up to .25 in. long. *Cymes* 3-10-flowered, stalked; *peduncles* and *pedicels* more or less glabrous. *Flowers* pink. *Fruit* bright red, about .3 in. long.

JAUN SAR and TEHRI-GARHWAL, 8-10,000 ft.: Deota temple, Bajamara; Kulni; Mundali, etc.

Fl. May, June.

3. *C. acuminata*, Lindl.; Fl. Br. Ind. ii. 385; Brandis For. Flora 209, Ind. Trees 295; Gamble Man. Ind. Timb. 326, Vern. *Leonshi*, *Ráuushi*, *Ruínshi*, Jaunsar.

A shrub smaller than the last, never with a spreading crown; bark dark bluish-grey, shining. *Leaves* 1.2-5 by .4-.8 in., ovate-lanceolate or elliptic, acuminate, silky-pubescent beneath; margins usually ciliate with silky hairs. *Flowers* white, .3-.4 in. diam., solitary or in few-flowered axillary and subterminal cymes. *Calyx* turbinate, reddish-brown inside. *Fruit* .3 in. long, turbinate, red when ripe.

JAUN SAR, 8, -10,000 ft.: common at Deoban, less so at Konáin and Mundáli.

Wood as of the last species. The branches are made into walking-sticks, but pieces of sufficient thickness are rather rare.

Fl. May, June. Fr. June, July.

4. *C. microphylla*, Wall.; Fl. Br. Ind. ii. 387; Brandis For. Flora 209, Ind. Trees 295; Gamble Man. Ind. Timb. 327. Vern. *Bheddā*, Jaunsar.

A small much-branched prostrate evergreen shrub; bark dark-grey, almost black. *Leaves* 3-5 by .2-35 in., ovate obovate, or elliptic, acute, obtuse or retuse, coriaceous, dark-green and glossy above, pubescent or pilose beneath, minutely petioled; margins recurved, more or less ciliate when young. *Flowers* white, .4-.5 in. diam., axillary, solitary. *Fruit* 3-4 in. long, globose or obovoid, finely pubescent, scarlet when ripe.

Common in JAUNSAR and TEHRI-GARHWAL, between 6,500 and 10,000 ft., trailing on rocks or spreading on grassy hill-sides. The branches are used in Kashmir for making baskets. The ripe fruit is sweet.

Fl. April-June. Fr. July, Aug.

Eriobotrya japonica, Lindl., Fl. Br. Ind. ii. 372; the Loquat, Vern. *Lokāt*, *Lukāt*, Hind.—is another well-known fruit tree of this Family. *Leaves* subsessile, 6-10 in. long, oblanceolate, acuminate, distantly serrate, hard, coriaceous, densely woolly and strongly nerved beneath. *Flowers* dull-white, fragrant, in terminal panicles. *Fruit* pyriform or globose, baccate, 1.5-2 in. long, yellow or orange when ripe; seeds 2-5, dark-brown, smooth. Much cultivated at DEHRA and SAHARANPUR. Fl. Nov., Dec. Fr. Mar., April.

XXXV. SAXIFRAGACEÆ.

Herbs, less frequently shrubs or trees. *Leaves* opposite or alternate, simple, usually exstipulate. *Flowers* regular, generally 2-sexual. *Calyx* more or less adnate to the ovary, rarely quite free. *Petals* 5, sometimes 4, rarely 0. *Stamens* free, as many as the petals or twice their number, exceptionally numerous. *Disk* annular or glandular. *Ovary* of 2 or 3-5 carpels and as many cells, rarely 1-celled; styles as many as the carpels, free or

united; ovules many; placentation axile (parietal in 1-celled ovaries). *Fruit* a berry or capsule, or composed of follicles. *Seeds* usually many, albuminous.

Analysis of the Genera.

Leaves opposite; stamens not fewer than 8.

Stamens 8 or 10

Flowers polygamous; stamens linear 1. HYDRANGEA.

Flowers 2-sexual; stamens winged . 2. DEUTZIA.

Stamens 20-40 3. PHILADELPHUS.

Lvs. alternate; stamens not more than 5.

Ovary almost wholly superior; fruit a capsule 4. ITEA.

Ovary wholly inferior; fruit a berry . 5. RIBES.

1. *Hydrangea*, Linn.

1. *H. altissima*, Wall.; Fl. Br. Ind. ii. 404; Brandis For. Flora 211, Ind. Trees 297; Gamble Man. Ind. Timb. 328. Vern. *Kathmorá*, Garhwál.

A large climbing shrub; bark cinnamon-colour, shining, membranous, loose, peeling off in long papery rolls. *Leaves* 3-6 in. long, ovate- or ovate-lanceolate, acuminate, sometimes cordate, entire or more or less dentate, membranous; main lateral nerves 6-8 pairs; petiole 1-2 in. long. *Flowers* cream-colour, polygamous, very small if fertile, enlarged to about 1 in. diam., and apetalous if sterile. *Calyx-tube* adnate to the ovary; limb 4-5 fid; segments of sterile flowers, 2-5 in. long, spreading. *Petals* (if present) 4-5, valvate, falling off in a cap. *Stamens* 10; filaments filiform. *Ovary* inferior, styles 2-4. *Fruit* a membranous capsule.

JAUNSAIR and TEHRI-GARHWÁL, in shady ravines up to 7,000 ft.: Bámsu, Lambátách, Kulni, etc.; Bear Garden, Chakrata.

The bark is used as a substitute for paper.

2. *Deutzia*, Thunb.

Shrubs with opposite branches. *Leaves* opposite, stellate-pubescent, exstipulate, serrate. *Flowers* white, more or less corymbose. *Calyx* adnate to the ovary;

teeth 5, small. *Petals* 5. *Stamens* 10, alternately longer; filaments winged. *Ovary* 3-5-celled; styles 3-5. *Fruit* a 3-5-celled capsule, dehiscing septicidally.

Analysis of the Species.

- Bark peeling off in papery rolls: leaves
 green beneath; petals imbricate . . . 1. *D. corymbosa*.
 Bark peeling off in thin longitudinal
 strips; leaves pale beneath: petals
 induplicate-valvate 2. *D. staminea*.

1. *D. corymbosa*. Br.; Fl. Br. Ind. ii. 406; Brandis For. Flora 212, Ind. Trees 296; Gamble Man. Ind. Timb. 329. Vern. *Bhújroi*, Jaunsar.

A shrub, 4-8 ft. high; bark light cinnamon-colour, peeling off in thin papery rolls, inner layer white. *Leaves* 1·5-3·5 by ·7-1·5 in., ovate-lanceolate, long-acuminate, closely serrate, membranous, with scattered stellate hairs beneath; petiole short. *Flowers* white, fragrant, ·5-·7 in. diam., in trichotomously corymbose terminal panicles; bracts small, deciduous; pedicels ·2-·3 in. long. *Calyx-teeth* shorter than the tube, spreading. *Petals* obovate or rounded, generally glabrous. *Styles* usually 3. *Capsule* ·2 in. diam., hemispherical, truncate.

Common in JAUN SAR and TEHRI-GARHWAL, above 6,000 ft., usually affecting shady ravines.

Wood white, soft, even-grained; weight 46 lbs. per c. ft.

Fl. May, June.

2. *D. staminea*, Br.; Fl. Br. Ind. ii. 407; Brandis For. Flora 212, Ind. Trees 296; Gamble Man. Ind. Timb. 329. Vern. *Ghúgtai*, *Dáhlochi*, Jaunsar.

A shrub, smaller than the above; bark dark-grey, peeling off in thin longitudinal strips, inner layer lighter coloured; branchlets scabrous with stellate pubescence. *Leaves* 1·2-5 by ·4-1·3 in., lanceolate, minutely serrulate, rough with stellate pubescence, grey beneath; petiole short. *Flowers* white, fragrant, ·3-·4 in. diam., in short trichotomous terminal panicles. *Calyx* stellate-hairy outside; teeth triangular, erect. *Petals* oblong, induplicate-valvate, pubescent outside. *Styles* usually 4. *Capsule* smaller than of the other species.

Very common in JAUN SAR and TEHRI-GARHWAL, 5-9,000 ft., usually associated with the last, but sometimes also found on sunny hill-sides which that species avoids.

Wood similar to that of *D. corymbosa*, but somewhat lighter.

Fl. April-June.

3. *Philadelphus*, Linn.

1. *P. tomentosus*, Wall.; Syn.—*P. coronarius*, L. var. *tomentosus*, Clarke.; Fl. Br. Ind. ii. 407.

A shrub with light-grey bark, somewhat resembling *Deutzia corymbosa*. *Leaves* opposite, 1-5-4 by .7-2-5 in., ovate-lanceolate, long-acuminate, finely hairy and rather glossy beneath; lateral nerves 3 pairs, sub-basal, prominent beneath, very arcuate; petiole .25-.5 long. *Flowers* white, .6-8 in. diam., solitary or in few-flowered axillary cymes; pedicels .3-.5 in. long. *Calyx-tube* adnate to the ovary; lobes 4, rarely 5, valvate, pubescent within. *Petals* 4, rarely 5, convolute in bud, .3-.5 in. long. *Stamens* 20-40; filaments subulate. *Ovary* inferior, 3-5-celled; styles 3-5, more or less combined at the base. *Fruit* a capsule, .5 in. long, 3-5-celled, turbinate or obovoid, subtruncate, dehiscing loculicidally.

Common in TEHRI-GARHWAL beyond the Tons, above 6,000 ft.; Lambātsāch, Deotā, etc. Rather scarce in JAUN SAR: Konāin.

Wood soft, white, with a large pith; weight 44 lbs. per c. ft.

Fl. May-July

4. *Itea*, Linn.

1. *I. nutans*, Royle; Fl. Br. Ind. ii. 408; Brandis For. Flora 213. Ind. Trees 299; Gamble Man. Ind. Timb. 329.

A small tree with dark-grey bark. *Leaves* alternate, 4-6 by 1-5-2-5 in., ovate or elliptic-oblong, acuminate, glandular-serrate or denticulate, subcoriaceous, glabrous, dark-green and shining above; lateral nerves 5-7 pairs, joined by distinct intramarginal veins. *Flowers* white, small, in fascicles of 2-5, in simple terminal and axillary racemes which are much longer than the leaves. *Calyx* adnate to the ovary at the base; teeth 5, erect, persistent. *Petals* 5 valvate, erect. *Stamens* 5. *Ovary* oblong, 2-celled; styles simple, furrowed, persistent. *Capsule* .2 in. long, septicidally 2-valved.

OUTER HIMALAYA and the DŪN, also TEHRI-GARHWAL; above Rājpur; banks of the Ré-nadi near Lachiwāla and at Nakraunda and Mothronwāla (1,800 ft.); Thadiār, 3,000 ft.

Wood brownish-white, moderately hard.

Fl. April-July. Fr. Oct., Nov

5. *Ribes*, Linn.

Usually unarmed shrubs. *Leaves* alternate, generally palmately lobed. *Flowers* middle-sized, often 1-sexual, racemed or solitary; pedicels bracteate. *Calyx* superior; tube as long as, or longer than, the ovary. *Petals* 4-5, epigynous, white yellow red or dark-purple. *Stamens* 4-5, epigynous. *Ovary* inferior, 1-celled; ovules numerous, on 2 perietal placentas; styles 2, free or connate. *Fruit* an oblong or globose berry.

Analysis of the Species.

- | | |
|--|-------------------------|
| Racemes erect in flower; calyx-tube hardly exceeding the fruit | 1. <i>R. glaciale</i> . |
| Racemes drooping; calyx-tube produced above the fruit | 2. <i>R. rubrum</i> . |

1. *R. glaciale*, Will.; Fl. Br. Ind. ii. 410; Brandis For. Flora 14, Ind. Trees 299; Gamble Man. Ind. Timb. 330.

A shrub, 5-8 ft. high, with shining brown stems; cuticle peeling off in long strips or rolls. *Leaves* 1-2.5 in. long, cordate, 3-5-lobed with the middle lobe often elongated, or not lobed and ovate, 3-5-nerved at the base, with 2-4 pairs of lateral nerves in the middle lobe, glabrous or pubescent along the nerves beneath, sometimes with scattered hairs above; margins crenate-serrate. *Flowers* about .25 in. diam., greenish (drying brownish or pink), in pubescent racemes 2-3 in. long which are erect in flower but drooping in fruit; bracts much longer than the pedicels. *Berries* acid, .25 in. long, globose, smooth, glabrous or minutely pubescent.

TEHRI-GARHWAL, above 9,000 ft.: Rikhsin. Rare, if it occurs at all, in JAUNSAK.

Fl. May. Fr. July.

2. *R. rubrum*, Linn.; Fl. Br. Ind. ii. 411; Brandis For. Flora 215, Ind. Trees 299; Gamble Man. Ind. Timb. 330 The Red Currant. Vern. *Karan*, Jaunsar, probably from *currant*.

A shrub 6-10 ft. high with dark-brown shining stems marked with horizontal lenticle-bars ; cuticle peeling off in long strips or rolls ; young shoots red, glabrate. *Leaves* (closely resembling those of *Acer cæsum*) 3-5 in. diam., as broad as long or broader, cordate, 3-5-lobed, crenate-serrate, 3-5-nerved at the base, membranous, glabrescent, somewhat shining beneath ; lateral nerves 3-5 pairs on the 3 larger lobes, depressed above, very prominent beneath ; petiole red, 3-4 in. long, flattened and with a few scattered grey hairs along the margins near the base. *Racemes* 4-6 in. long, pubescent, many-flowered, from the nodes of last year's shoots with a few small leaves near the base ; bracts not exceeding the pedicels. *Flowers* greenish-yellow, .3-.4 in. diam. ; pedicels about 1 in. long. *Berries* .3-.4 in. long, globose, smooth, red.

Common in JAUNSAK and TEHRI-GARHWAL, above 7,500 ft. —Deoban to Mundali ; also at Deotā.

Fl. April, May. Fr. May, June.

Saxifraga ligulata, Wall.: Fl. Br. Ind. ii. 398. The Wax-Flower. Vern. Páshánbhed, Sans. Shūlphāra (the rock-splitter, which curiously corresponds to the meaning of the generic name), Dhonk-phúlutē, Jaunsar,—is an herbaceous plant common and conspicuous enough to deserve mention. *Leaves* 3-5 in. diam., suborbicular, fleshy, glabrous, strongly ciliate, often pinkish beneath. *Flowers* pinkish-white, waxy, .6-.8 in. diam. *Petals* clawed *Car-pels* and *styles* 2, the latter very long. Fl. April, May.

Order 2—MYRTALES.

XXXVI. RHIZOPHORACEÆ.

Trees or shrubs. *Leaves* opposite, entire, coriaceous, generally glabrous ; stipules interpetiolar, early caducous. *Flowers* regular, axillary, usually bisexual. *Calyx* more or less adnate to the ovary or free, 4-14-toothed or lobed, persistent. *Petals* as many as the calyx-lobes. *Stamens* 2-4 times the number of petals ; filaments free. *Ovary* 5-1-celled by the absence of

the septa ; styles usually connate ; ovules pendulous. *Fruit* 1-celled, 1-seeded, coriaceous, indehiscent.

1. *Carallia*, Roxb.

1. *C. integerrima*, DC. : Fl. Br. Ind. ii. 439 ; Brandis For. Flora 219 ; Gamble Man. Ind. Timb. 335. Syn.—*C. lucida*, Roxb. ; Brandis Ind. Trees 305, 709.

An evergreen tree ; bark dark-grey and smooth on old stems, lighter-grey and corky on young poles, often developing bunches of fleshy adventitious roots on the trunk. *Leaves* 3-5 by 1-5-3 in., elliptic-obovate, entire or minutely serrulate above the middle, coriaceous, glabrous, shining ; margins usually recurved ; main lateral nerves 8-10 pairs, indistinct until dry ; petiole .2-4 in. long, stout, margined ; stipules .5-1.2 in. long, interpetiolar, lanceolate, convolute, terminating the branchlets. *Flowers* sessile, 6-8-merous, .2 in. across, in short axillary trichotomous cymes ; peduncles and pedicels stout. *Calyx-lobes* 5-8, erect, valvate. *Petals* 5-8, white, orbicular, serrate at the apex. *Stamens* twice as many as the petals and opposite to them ; filaments filiform. *Fruit* about .2 in. across, globose, 1-celled, usually 1-seeded.

Only a few trees have been found in the Nakraunda swamp and along the banks of the Ré-nadi near Lachiwála, 1,800 ft. ; also on the Táwá nálá near Khairi, 1,200 ft.

The heartwood is red, hard and durable, and works and polishes well. It has a very pretty silver-grain resembling that of the oaks. It is used in South Kanara for furniture and cabinet-making and in Burma for planking, furniture and rice-pounders. The leaves are lopped for cattle-fodder.

Fl. Dec.-April.

XXXVII. COMBRETACEÆ.

Trees or shrubs. *Leaves* usually simple, petiolate, entire, opposite or alternate, exstipulate. *Flowers* bracteate, usually bisexual. *Calyx-tube* adnate to the ovary ; lobes 4-5, valvate. *Petals* 4-5, or none. *Stamens* 4-5, or twice as many, inserted on the calyx. *Ovary* inferior, 1-celled ; style simple ; ovules 1-7, pendulous

from the apex of the cell. *Fruit* usually a coriaceous drupe, 1-celled, 1-seeded, winged or angular; seed exalbuminous; cotyledons convolute or plano-convex, often fleshy and oily.

Analysis of the Genera.

Flowers in spikes or racemes.

Large trees with alternate or sub-opposite leaves. Petals none . . . 1. *TERMINALIA*.

Climbing shrubs with opposite leaves.

Petals generally present . . . 3. *COMBRETUM*.

Flowers in heads; leaves alternate or inconstantly opposite; petals none . . . 2. *ANOGEISSUS*.

1. *Terminalia*, Linn.

Large trees. *Leaves* alternate or sub-opposite, entire or slightly crenulate, exstipulate, often with glands on the petiole. *Flowers* small, sessile, usually bisexual; bracts deciduous. *Calyx-tube* produced over the ovary with a constricted mouth; lobes 4-5, valvate. *Petals* 0. *Stamens* 8-10, inserted on the calyx-tube in two rows. *Ovary* 1-celled; ovules 2-3, pendulous. *Fruit* oblong ovoid ellipsoidal or globose, winged or angular, with a coriaceous or bony kernel; cotyledons convolute.

Analysis of the Species.

Fruit fleshy, not winged.

Petiole long; fruit velvety, not ribbed . . . 1. *T. belerica*.

Petiole short; fruit glabrous, more or less ribbed . . . 2. *T. Chebula*.

Fruit coriaceous, with 5 broad wings . . . 3. *T. tomentosa*.

1. *T. belerica*, Roxb.; Fl. Br. Ind. ii. 445; Brandis For. Flora 222, Ind. Trees 307, 709; Gamble Man. Ind. Timb. 337. Vern. *Baherá*, Hind.

A large deciduous tree with bluish or ashy-grey bark, uneven with longitudinal furrows. *Leaves* alternate, crowded towards the ends of the branches, 3-8 in. long, obovate-elliptic, coriaceous, pale beneath, subacute or acuminate; lateral nerves 5-8 on either side of the thick midrib; base often unequal; petiole 1-3 in., usually glandular. *Spikes* 3-6 in. long, simple, slender, interrupted. *Flowers* about .2 in. across, pale-white or greenish-yellow, with an offensive smell, the upper often male; bracts early caducous. *Calyx-lobes* triangular, woolly inside. *Ovary* tomentose. *Fruit* 1 in. long, ovoid ellipsoidal or globose, grey-velvety; nut thick-walled and hard.

It is a constant companion of Sál and is found almost everywhere in the DÚN and SAHÁRANPUR FORESTS; also in JAUNSAIR in the Amláwa and Tons Valleys.

It grows to a height of 80-100 ft. with a girth of 8-10 ft., and is easily recognized from a distance by its characteristic bark and broad massive crown. The wood is light-grey or yellowish, hard and coarse-grained, not durable; heartwood and annual rings not distinct: weight about 50 lbs. per c. ft. It is used for various purposes, from house-building to packing-cases, and sells readily in the region of this Flora. The fruit is very valuable, being one of the myrobalans of commerce. "It is a favourite food of monkeys, deer, sheep, goat and cattle,"—*Sir D. Brandis*, and is used in dyeing and making ink. The kernel is edible, and gives an oil which is used for the hair.

Fl. April-June, after the new leaves. Fr. Dec.-Feb.

2. **T. Chebula**, Retz.; Fl. Br. Ind. ii. 446; Brandis For. Flora 223, Ind. Trees 308; Gamble Man. Ind. Timb. 333. Vern. *Har*, *Harr*, *Harh*, or *Hararkh*, Hind.

A large deciduous tree with dark-brown bark; young parts covered with rusty hairs. *Leaves* mostly sub-opposite, 3-6 in. long, ovate or oblong-ovate, acuminate; lateral nerves arcuate, prominent, 6-12 on either side of the midrib; base acute or rounded; petiole hardly exceeding 1 inch, often with 2 or more glands on the upper side. *Flowers* about .1 in. across, all bisexual, sessile, dull-white, in panicle or clustered usually terminal spikes; bracts subulate. *Calyx-lobes* acutely triangular, covered inside with brown hairs; limb cup-shaped. *Stamens* 8-10; filaments long, spreading. *Fruit* 1-2 in. long, obovoid, ellipsoidal or ovoid, more or less distinctly ribbed; nut hard, with a rough grooved surface.

Found in the same localities as the last, but is generally less common. It is, however, fairly common in certain limited areas, e.g., along the Lambi Ráu, Tháno; south of the Sample area, Lachiwála; forests near Timli, etc.

In the region of this Flora it is a smaller tree than the last. The heartwood is pale or dark-brown with a greenish tinge, finely mottled, hard, close-grained, fairly durable, and is used for house-building, agricultural implements and furniture; weight about 60 lbs. per c. ft. The bark, the galls formed on young twigs, and the fruit are used for tanning and dyeing. Indeed the last is the most important part of the tree, being the black myrobalan of commerce and is largely exported to Europe from Bombay. The unripe fruit is a favourite drug in Hindu medical practice.

New leaves in April. Fl. April-June. Fr. Jan.-Mar.

3. T. tomentosa. W. & A.; Fl. Br. Ind. ii. 447; Brandis For. Flora 225, Ind. Trees 310; Gamble Man. Ind. Timb. 341. Vern. *Sáin*, Dún and Saháranpur; *Asainá*, Hind.

A large deciduous tree; bark dark-grey or black much furrowed, exfoliating in thick rectangular plates; inner bark reddish-brown; young parts rusty-pubescent. *Leaves* alternate or sub-opposite, 5-9 by 2.5-4 in., oblong elliptic or obovate, coriaceous, glabrescent above, tomentose beneath; lateral nerves 10-20 pairs, parallel, slightly arcuate; base often unequal sided, acute or rounded; petiole .3-.4 in., often with a gland or two on the sides. *Flowers* bisexual, dull-yellow, .1-1.5 in. across, sessile, in large erect panicle spikes. *Calyx-lobes* ovate, broad-acute, often hairy; free part of the tube salver-shaped. *Fruit* 1.5-2.5 in. long, with 5 broad transversely-striated coriaceous wings having a crenulate edge.

Associated with *Sál* in the DEHRA AND SAHÁRANPUR DIVISIONS, especially in clayey localities; also found in the OUTER HIMALAYAN VALLEYS, up to 4,000 ft.

It grows to a height of 80-100 ft. with a girth of 8-10 ft. Sapwood reddish or yellowish-white; heartwood dark-brown, with darker streaks, very hard, seasons well, but is liable to split. It is used for house-building, agricultural implements and such other purposes. It is also an excellent fuel and gives very good charcoal. The bark is much used for tanning and sometimes also for dyeing. The "Tassar" silkworm is fed on the leaves in the Central Provinces. *Sáin* coppices and pollards well, and is a good nurse for young *Sál* in frosty localities. The ovary is sometimes attacked by a gall-insect which prevents the fruit being formed.

New leaves May, June. Fl. June-Aug., and sometimes a second flush in the cold season (Dec. 1893 in the Dún). Fr. Feb.-April.

T. Arjuna, Bedd.; Fl. Br. Ind. ii. 447; Vern. *Arjun*, Hind;—is a tree closely resembling the last species in foliage and inflorescence, but differs in having smooth grey bark and smaller 5-7-

winged fruit. It is an excellent avenue tree and has been planted as such near Fatehpur on the Saháranpur-Chakrata road, and (but looking almost like self-sown) on the Dehra-Hardwar and Hardwar-Rikhikesh roads not far from Pardúni and in the swamp near that place. The wood is used for much the same purposes as that of *Sáin*.

Fl. April, May. Fr. Cold season.

2. *Anogeissus*, Wall.

1. *A. latifolia*, Wall.; Fl. Br. Ind. ii. 450; Brandis For. Flora 227, Ind. Trees 315; Gamble Man. Ind. Timb. 346. Vern. *Báklí*, *Bánklí*, Hind.

A tall tree with smooth greenish-white bark. *Leaves* alternate or inconstantly opposite, 2-4 by 1-2-5 in., elliptic, ovate or ovate-lanceolate, acute, obtuse or emarginate, subcoriaceous, glabrescent; petiole .3-.5 in. long. *Flowers* small, in globose heads; heads about .5 in. diam., in short axillary racemes. *Calyx-tube* compressed, laterally 2-winged, long and narrowed above the ovary. *Petals* 0. *Stamens* 10, in two series. *Ovary* 1-celled; ovules 2, pendulous. *Fruit* a dry drupe .3 by .2 in., compressed, narrowly 2-winged, imbricately arranged in the head, crowned with the remains of the calyx-tube which is now modified into a stiff beak.

Common in the DÚN and SAHÁRANPUR FORESTS and on the OUTER HIMALAYAN slopes ascending to 4,000 ft.; sometimes gregarious in small patches on alluvial banks of streams.

Wood grey, close- and even-grained, compact, hard, very tough and elastic, but splits in seasoning, and is not durable unless kept dry; weight 55-70 lbs. per c. ft. It is used extensively for construction, furniture, agricultural implements, house-posts, poles for carrying loads and such other purposes requiring toughness and elasticity. The tree yields a very clear gum which is soluble in water, and the leaves are much valued for tanning.

Fl. May, June. Fr. Cold season.

3. *Combretum*, Linn.

1. *C. decandrum*, Roxb.; Fl. Br. Ind. ii. 452; Brandis For. Flora 221, Ind. Trees 312; Gamble Man. Ind. Timb. 349. Vern. *Ruel* or *Roel*, Dún.

A large climbing shrub; young parts covered with silky pubescence. *Leaves* opposite, 4-5 by 1-5-2-3 in., elliptic-oblong, acuminate, glabrous, the floral ones or bracts 2-2-5 in. long, dull-white,

villous; lateral nerves 6-8 on either side of the midrib, arcuate; petiole .2-.4 in. long. *Flowers* greenish-white, about .15 in. long, numerous, in dense villous cylindrical racemes about 1 in. long, which in their turn are arranged in large terminal panicles. *Calyx* hairy; lobes 5, valvate, deciduous. *Petals* 5, small, oblong, silky pubescent inserted between the calyx-lobes. *Stamens* 10, in two series. *Ovary* 1-celled; ovules 2-5, pendulous. *Fruit* 1 in. long, oblong or elliptic, with 4-5 smooth papery wings.

Very common in the WESTERN DÚN, especially from Ámbári to Kálsi. All the hill-side round the latter town is clothed in white when this climber flowers with its characteristic petaloid bracts.

Fl. Feb., Mar. Fr. May, June.

C. nanum, Ham.; Fl. Br. Ind. ii. 457.—is a small procumbent undershrub found in grass-lands near Maindrot in the Tons Valley, TEHRI-GARIHWAL, and also occasionally in similar localities in the DÚN, e.g., Sabhāwāla. *Leaves* opposite, 2-4 by 1.5-3.5 in., ovate or obovate, glabrous. *Flowers* in terminal and axillary racemes. *Fruit* 1.5 by 1 in., coriaceous, light, with 4-5 papery wings. It grows annually from a perennial rootstock down to which it is burnt by forest fires.

Quisqualis indica, Linn.; Fl. Br. Ind. ii. 459, the Rangoon-creeper,—is a climbing shrub cultivated in gardens in SAHĀRANPUR and the DÚN. *Leaves* opposite, about 4 in. long, obovate, acuminate, entire. *Calyx-tube* prolonged about 2 in. above the ovary; limb 5-fid. *Petals* white turning to red, oblong or round. *Fruit* extremely rare, about 1 in. long, sharply 5-angled, glabrous, black.

XXXVIII. MYRTACEÆ.

Trees or shrubs, rarely herbs. *Leaves* opposite, exceptionally alternate, simple, usually entire and gland-dotted, exstipulate, mostly coriaceous. *Flowers* generally bisexual, solitary or in heads cymes or corymbs. *Calyx-tube* adnate to the ovary; limb 4-5-cleft, or entire, deciduous or persistent. *Disk* coating the calyx-tube. *Petals* inserted on the disk, as many as the calyx-lobe and alternating with them, rarely absent. *Stamen*

usually indefinite, inserted with the petals in several rows; filaments free or connate at the base forming bundles or a short tube. *Ovary* syncarpous, inferior or half-inferior 1-celled, 1-ovuled, or 2-many-celled with indefinite ovules on axile placentas. *Fruit* dehiscent or indehiscent, crowned with the remains of the calyx-limb; seeds compressed or angular, exalbuminous.

Analysis of the Genera.

- | | |
|---|---------------------|
| Leaves opposite, entire, gland-dotted | 1. <i>EUGENIA</i> . |
| Leaves alternate, crenate-serrate, not gland-dotted | 2. <i>CAREYA</i> . |

1. *Eugenia*, Linn.

Evergreen trees or shrubs. *Leaves* opposite, entire, penninerved. *Flowers* usually tetramerous, in lateral or terminal trichotomous cymes or panicles. *Bracts* small, deciduous. *Calyx-tube* globose or more or less elongate; lobes usually 4. *Petals* generally 4, free or united in a calyptra. *Stamens* indefinite, in several series, free or slightly combined into four bundles; anthers versatile. *Ovary* usually 2-celled, with several ovules in each cell. *Fruit* a drupe-like berry, crowned with the remains of the calyx-limb; seeds variously compressed.

Analysis of the Species.

- | | |
|---|---------------------------|
| Lvs. subcoriaceous, soft; lateral nerves distant | 1. <i>E. operculata</i> . |
| Lvs. coriaceous, tough; lateral nerves very close | 2. <i>E. Jambolana</i> . |

1. *E. operculata*, Roxb.; Fl. Br. Ind. ii. 498; Brandis For. Flora, 234, Ind. Trees 322; Gamble Man. Ind. Timb. 360 Vern. *Pidman*, *Thuti*, Dún.

A moderate-sized evergreen tree; bark rough with irregular hard scales. *Leaves* 3-6 by 2-3-5 in., broad-ovate or elliptic, rounded at the apex or obtusely acuminate, very variable in shape and size, subcoriaceous, soft, turning red in the cold season; lateral nerves 8-12 pairs, prominent beneath, gradually fainter towards the margin; petiole .7-1 in. long. *Flowers* tetramerous, small, greenish, sub-sessile, in 3-flowered cymes arranged in trichotomous lateral panicles below the current year's leaves. *Calyx* campanulate, with short obtuse lobes. *Petals* united and falling off in one piece (*operculum*). *Berry* globose or ovoid, .3-5 in. diam., juicy.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in blanks inside Sál areas, where it is often the first tree to appear, under whose shelter seedlings of superior species have a better chance against frost and excessive heat.

Heartwood not distinct. Wood brown or reddish-grey, hard, close and fine-grained; weight 45-50 lbs. per c. ft. It is used for building and agricultural implements. The fruit is edible.

Fl. April, May, sometimes also in autumn. Fr. three months after flowering.

2 **E. Jambolana**, Lam.; Fl. Br. Ind. ii. 499; Brandis For. Flora 233, Ind. Trees 323; Gamble Man. Ind. Timb. 361. Vern. *Jáman*, *Jámun*, Hind.

A large evergreen tree; bark light-grey, fairly smooth, with shallow depressions caused by exfoliation. *Leaves* 3-6 by 1-5-2-5 in., very variable in shape, ovate-oblong or oblong-lanceolate, acuminate, coriaceous, tough, smooth, shining above except when very old; lateral nerves numerous, almost straight, very fine, uniting within the margin to form intramarginal nerves; petiole .3-1 in., channelled. *Flowers* tetramerous, small, greenish, subsessile, arranged in threes in lateral or terminal trichotomous panicles. *Calyx-tube* funnel-shaped; limb campanulate, subtruncate. *Petals* united into a calyptra and falling off in one piece. *Berry* .5-1 in. long, oblong-obovoid or sub-globose, pink while ripening, black, smooth, shining and very juicy when fully ripe, deep-pink below the thin elastic black skin.

Very commonly associated with Sál in the DÚN, less so in the SAHÁRANPUR FORESTS. It is almost gregarious in damp and swampy localities, mixed with laurels and other evergreen trees. It is also found in the Tons Valley, JAUNSAH and TEHRI-GARHWAL, up to 4,000 ft., and along streams in the SAHÁRANPUR SIWALIKS.

The heartwood is reddish-brown, tough and hard, very durable under water but less so and liable to warp if kept dry; weight about 45 lbs. per c. ft. It is used for building, agricultural implements and

well-work, being especially suitable for use under water. The bark is used for dyeing and tanning and also in medicine. The fruit is eaten, and is considered good for people suffering from want of appetite or enlargement of the spleen. The kernel of the fruit is a specific for diabetes.

E. Jambos, Linn., Fl. Br. Ind. ii. 474. Vern. *Guláb Jámun* or *Guláb Jám*, Hind., the Rose-apple,—is cultivated for its fruit and for ornament in gardens in the DÚN. It is an evergreen tree with narrow lanceolate acuminate shining leaves, and large white tassellike tetramerous flowers in short cymose terminal racemes. Berry 1-2 in. long, obovoid or subglobose, crowned with the 4 persistent calyxlobes, having a sweet taste and a delicate odour of rose when ripe,—whence the vernacular names.

2. *Careya*, Roxb.

1. *C. arborea*, Roxb.; Fl. Br. Ind. ii. 511; Brandis For. Flora 236, Ind. Trees 322; Gamble Man. Ind. Timb. 364. Vern. *Kumbi*, *Kumbhi*. Hind.

A fairly large deciduous tree; bark dark-grey, exfoliating in thin narrow strips, fibrous inside. Leaves alternate, 6-12 by 3-6 in., obovate, oblanceolate or oblong, obtuse or shortly acuminate, sessile or narrowed into a very short marginate petiole, finely crenate or serrate, rather membranous, glabrous. Flowers sessile, 3-4 in. across, usually a few together in terminal spikes, 3-8 in. long. Calyxlobes 4, ovate, obtuse, imbricate; tube almost wholly adnate to the ovary, funnel-shaped. Petals 4, about 2 in. long, elliptic, white, very tender, caducous. Stamens very numerous, in several series; filaments red, filiform, 2-3 in. long, connate into a short tube below, the innermost and outermost without anthers. Ovary 4-rarely 5-celled; style long, simple, erect; ovules many, on axile placentas. Fruit globose, about 3 in. diam., crowned with the calyx-segments and the remains of the long filiform style.

Found only sporadically in the DÚN and SAHÁRANPUR FORESTS, usually in shady places.

The heartwood is scanty, dull-red or reddish-brown, mottled, even-grained, hard, strong and elastic, takes a good polish, seasons well and is very durable, the weight varies between wide limits, being 38-60 lbs. per c. ft. It is used for agricultural implements and cart-building, and is much sought after by boatmen in Assam for oars and rudders on account of its elasticity and durability. The bark is used in medicine, and fuzes, coarse cordage and sacks are made from the inner substance.

Fl. and new leaves Mar., April. Fr. July.

C. herbacea, Roxb. ; Fl. Br. Ind. ii. 510, is a small perennial undershrub having a woody rootstock, found on grassy slopes of the SIWALIKS, and in the Pathri forest, SAHARANPUR. *Leaves* .6-8 by 2-3 in., obovate, oblanceolate or spatulate. *Petals* about 1.5-2 in. long, greenish-purple, elliptic. *Fruit* 1.5 in. diam., much like that of *C. arborea*.

The following Genera need only be briefly noticed :—

1. PSIDIUM, Linn. *Leaves* opposite, aromatic but not dotted. *Flowers* large, white, on axillary peduncles. *Calyx-tube* obovate ; lobes 4-5, valvate. *Petals* free. *Fruit* a many-seeded berry.

P. Guyava, Linn. ; Fl. Br. Ind. ii. 468. Vern. *Amrud* Hind., —is the Guava tree of gardens. The wood is hard and even-grained and is used for wood-engraving, instruments, and handles of spears.

2. EUCALYPTUS, L'Her. *Leaves* in saplings opposite, horizontal, cordate, sessile ; in mature trees alternate, vertical, petiolate, ovate to lanceolate acuminate, falcate. *Flowers* in umbels or heads. *Stamens* very numerous, capped in the bud with a caducous operculum. *Fruit* woody consisting of the enlarged calyx-tube ; seeds often very minute.

Many species of this very large Australian Genus have been introduced in India, and plantations of one of them—*E. globulus*, Labill, the Blue Gum—successfully made in the Nilgiris. *E. tereticornis*, Smith, *E. citriodora*, Hooker, *E. Saligna*, Sm., *E. Staigeriana*, F. V. M., *E. drepanophylla*, F. V. M. and *E. rostrata*, Schl. are growing well in DEHRA and SAHARANPUR.

3. BARRINGTONIA, Forst. *Leaves* alternate, crowded at the ends of the branches, crenate-serrate, not dotted. *Flowers* in long terminal or lateral racemes. *Calyx-tube* ovoid. *Petals* 4-5, imbricate. *Stamens* indefinite ; filaments very long. *Fruit* fibrous and berry-like.

B. acutangula, Gærtn. ; Fl. Br. Ind. ii. 508. Vern. *Sanáffar*, Injar, Hind.,—cultivated in gardens in DEHRA for its red flowers,

in long pendulous racemes. *Leaves* obovate, usually serrulate, narrowed into a short petiole. *Ovary* 2-celled. *Fruit* oblong, 4-angled. The wood has a handsome silver-grain and can be used for furniture.

4. *Callistemon viminalis*, Cheel. The Bottle Brush tree.—A small evergreen tree with alternate, linear-lanceolate leaves and crimson flowers in spikes, indigenous to Queensland and New South Wales, is cultivated in gardens.

XXXIX. MELASTOMACEÆ.

Herbs or shrubs. *Leaves* opposite or whorled, simple, entire, 3-7-nerved from the base to the apex. *Flowers* usually terminal, regular, 2-sexual. *Calyx-tube* generally constricted above, more or less adnate to the ovary. *Petals* twisted in bud. *Stamens* 4-10, alternate ones being often rudimentary; anthers usually opening by pores at the apex, connective tubercled or spurred. *Ovary* 4-5-celled; style simple, filiform. *Fruit* usually a many-seeded capsule. *Seeds* exalbuminous.

This Order is of little interest in this part of the country although some Genera as *Memecylon*, are common and important in the forests of Southern and Eastern India. The following plants of Genus *Osbeckia*, Linn.,—need only be briefly noticed:—

1. *O. stellata*, Wall.; Fl. Br. Ind. ii. 517. A hairy shrub, 4-6 ft. high, with tetragonal branches, found at Chakrata, Mussoorie, etc. *Leaves* 3 in. long, lanceolate, 5-nerved, with short hairs on both surfaces; petiole .4 in. *Flowers* pink or purple, about 2.5 in across. *Calyx* densely woolly outside. *Fruit* .5 in. long, ovoid, felted outside. Fl. Aug.-Oct.

2. *O. chinensis*, Linn.; Fl. Br. Ind. ii. 515. An undershrub about 2 ft. high, found in damp localities in the DŪN, e.g., Rāmgarh. *Leaves* 2-3 in. long, narrow-oblong, 3-5-nerved, hairy; petiole .15 in. *Flowers* mauve. *Calyx* slightly pubescent outside, nearly glabrous in the fruit. *Fruit* ovoid, .3 in. long. Fl. Sept., Oct.

XL. LYTHRACEÆ.

Trees, shrubs, or herbs, often with quadrangular branches. *Leaves* entire, generally opposite; stipules none. *Flowers* bisexual, usually regular, solitary or in cymes or panicles. *Calyx-tube* free, persistent; lobes 3-6, valvate. *Petals* as many as the calyx-lobes, and alternating with them, rarely absent. *Stamens* definite or indefinite, inserted on the calyx-tube. *Ovary* 2-6-celled, usually free; style long, persistent; ovules many, attached to an axile placenta. *Fruit* a capsule, 1-4- or many-celled; seeds numerous, without albumen.

Analysis of the Genera.

Flowers irregular; ovary superior	1	WOODFORDIA.
Flowers regular; ovary superior		
Flowers 4-merous; stamens 8	2	LAWSONIA.
Flowers 6-merous; stamens indefinite	4	LAGERSTREMIA.
Flowers regular; ovary inferior	4	PUNICA.

1. *Woodfordia*, Salisb.

1 *W. fruticosa*, Kurz.; Syn.—*W. floribunda*, Salisb.; Fl. Br. Ind. ii. 572; Brandis For. Flora 238, Ind. Trees 341; Gamble Man. Ind. Timb. 369. Vern. *Dhāulā*, *Dhāu*, Hind.; *Dhāttrī*, Sans.

A large shrub with long spreading branches; stem more or less fluted, often with 1 or 2 concentric bands of cortical tissue inside the wood; bark smooth, peeling off in thin scales; young shoots and leaves with numerous black glands. *Leaves* opposite or sub-opposite, sometimes in whorls of 3, distichous, subsessile, 2-4 by .8-1.3 in., lanceolate or ovate-lanceolate, usually acuminate, rounded or cordate at the base, entire, pale and generally grey pubescent beneath; lateral nerves 6-12 pairs, prominent beneath and joined by intramarginal veins. *Flowers* in short paniced axillary cymes, rarely solitary. *Calyx* .4-.6 in. long, tubular, bright-red, curved, oblique at the mouth; teeth 6, short, with as many minute accessory lobes outside. *Petals* 6, white, acute, inserted in the sinuses of the calyx-tube and scarcely exceeding the calyx-teeth. *Stamens* 12, much exerted, declinate, inserted near the base of the calyx; filaments red; anthers versatile.

Ovary 2-celled; ovules many, on axile placentas. (The stamens and styles are of varying lengths, the flowers thus becoming dimorphic or trimorphic.) *Capsule* ellipsoid, included in the persistent calyx-tube; seeds many.

Very common in SAHÁRANPUR and the DÚN. Also in valleys up to 5,000 ft. in the HILLS, e.g., Ámláwa, Binálgádh, Dhárágádh, Dhármigádh, Tons and Pábar Valleys, etc.

Wood reddish-white, close-grained, hard, weighing 46 lbs. per c. ft. It is suitable for axe-handles, but is used chiefly for fuel. The flowers give a red dye, which is used for dyeing silk. The bark is used in Hindu medicine.

Fl. Feb.-April. Fr. April-June.

2. *Lawsonia*, Linn.

1. *L. inermis*, L.; Syn.—*L. alba*, Lamk.; Fl. Br. Ind. ii. 573; Brandis For. Flora 238, Ind. Trees 340; Gamble Man. Ind. Timb. 370. Vern. *Mehndi*, Hind. The Henna Plant.

A shrub with thin greyish-brown bark; branchlets angular, sometimes spinescent. *Leaves* opposite, .7-1 in. long, elliptic, acute at both ends or the tip obtuse, minutely petioled, entire, coriaceous. *Flowers* .2 in. diam., greenish-white, sweet-scented, in large cymosely-branched terminal panicles. *Calyx-tube* exceedingly short; lobes 4, .1 in. long, ovate, persistent. *Petals* 4, wrinkled. *Stamens* usually 8, inserted in pairs between the petals. *Ovary* free, 4-celled; ovules many, on axile placentas; style long. *Capsule* .2 in. diam., globose, ultimately 1-celled, irregularly breaking up; seeds angular, on a central placenta.

It is cultivated in SAHÁRANPUR and the DÚN, indeed throughout India, as a hedge-plant, and also for its leaves, which are used to dye the nails, skin and beard. A plaster of the green leaves is said to be good for itches and other skin-diseases. A delightful essence is extracted from the flowers, which passes by the name *Henna* in Upper India.

Fl. and fr. throughout the year.

3. *Lagerstroemia*, Linn.

Trees or shrubs. *Leaves* opposite (or the uppermost alternate), entire, short-petiolate. *Flowers* bracteate in axillary or terminal panicles. *Calyx-tube* funnel-shaped,

smooth or grooved; lobes usually 6, ovate, valvate. *Petals* 6, long-clawed, inserted between the calyx-lobes. *Stamens* numerous; filaments filiform exerted; anthers versatile. *Ovary* sessile, 3-6-celled; style filiform; ovules numerous on axile placentas. *Capsule* coriaceous, 3-6-celled, loculicidally dehiscent, strongly seated on the persistent calyx; seeds winged.

1. **L. parviflora**, Roxb.; Fl. Br. Ind. ii. 575; Brandis For. Flora 239, Ind. Trees 338; Gamble Man. Ind. Timb. 371. Vern. *Dhaurá*, *Dhauri*, Dún; *Adhuári*, Saháranpur

A fairly large deciduous tree; bark light-brown or ash-coloured, even, smooth, exfoliating in dark-coloured scurfy pieces. *Leaves* 2.5-4 in. long, oblong, acute or acuminate, coriaceous, glabrous above, glaucous and very closely reticulate beneath; petiole about .1 in. long. *Flowers* .2-.3 in. across, white, fragrant, in lax axillary and terminal panicles. *Calyx* smooth, glabrous or pubescent. *Petals* very membranous, with a wavy margin. *Filaments* too weak to be straight, 6 of the outermost series longer than the rest. *Capsule* ovoid or cylindrical, .6-1 by .4-.6 in., a quarter immersed in the somewhat accrescent and woody calyx; seeds with a terminal wing having a thick curved back, .5 in. long including the wing.

A constant companion of Sál and also one of the principal species in scrub jungles; hence very common in the DÚN and SAHÁRANPUR FORESTS.

Wood greyish-brown, often with a reddish tinge, smooth- and even-grained, very hard, seasons well, takes a fine polish; fairly durable; weight 40-60 lbs. per c. ft. It is used for agricultural implements, for construction, buggy-shafts and axe-handles. The bark and the leaves are used for tanning.

New leaves in May. Fl. May-July. Fr. Autumn, but remains long on the tree.

L. indica, Linn.; Fl. Br. Ind. ii. 575. Vern. *Sáoni*, Hind.—a shrub with showy flowers, is cultivated in gardens throughout India and is conspicuous in DEHRA DÚN. *Leaves* 2 in. long, glabrous, oblong. *Calyx* not woody in the fruit. *Petals* bright-pink, purple or milky-white, long-clawed, much curled.

L. Flos-Reginæ, Retz.; Fl. Br. Ind. ii. 577. Vern. *Járu*l E. Beng., *Ajhár*, Assam—is a large tree cultivated in gardens at DEHRA for ornament. *Leaves* 3-10 in. long, elliptic or lanceolate

petiolate. *Flowers* 2-3 in. across, mauve, in large terminal panicles. *Calyx* woody and much grooved in the fruit. *Petals* clawed, margins very wavy. *Capsule* 1 in. long, globose. It is a well-known timber tree of Eastern Bengal, Assam and Burma.

4. *Punica*, Linn.

This is an anomalous Genus, being closely allied to MYRTACEÆ through *Psidium* and to ROSACEÆ through *Cydonia*.

1. *P. Granatum*, Linn.; Fl. Br. Ind. ii. 581; Brandis For. Flora 241, Ind. Trees 341; Gamble Man. Ind. Timb. 377. The Pomegranate. Vern. *Dānoi*, Jaunsar; *Anār*, Hind.

A shrub or small tree with dark-grey bark; branchlets often spinescent. *Leaves* opposite, sub-opposite or clustered, 1-2·5 by ·4-1 in., oblong, obovate or oblanceolate, obtuse, narrowed to a short marginate petiole, entire, rather membranous, quite glabrous, shining, lateral nerves indistinct. *Flowers* sessile, terminal, solitary or in short 3-flowered cymes. *Calyx* adnate to the ovary below, (in flower) about 1 by ·5-·6 in., tubular, greenish-red, fleshy; lobes 5-7, valvate, acute, sub-erect. *Petals* as many as the calyx-lobes, ·5-1 in. long, oblanceolate, very membranous, wrinkled, bright-red. *Stamens* numerous, inserted in the calyx-tube below the petals; filaments distinct. *Ovary* inferior, with many cells in two whorls; ovules numerous on axile placentas in the inner cells and parietal in the outer; style long; stigma capitate. *Fruit* (in the wild state) about 1·5 in. diam., globose, with a reddish-brown coriaceous rind which ultimately breaks up irregularly; seeds about ·2 in. long, angled, with a pellucid reddish-yellow or ruby-coloured aril filled with an acid or sweet juice. Under cultivation the fruit is about 3 in. in diam., and very much better in quality.

The Pomegranate is cultivated in SAHARANPUR and the DÚN, and is found wild in valleys below 6,000 ft. in JAUNSAAR and TEHRIGARHWAL; Dhármigádh, Maindrot, Binálgádh, Khúnigádh, etc.

Wood light-yellow, compact and close-grained; weight 57 lbs. per c. ft. The flowers give a light red dye. The fruit is eaten, the bark and the rind of the fruit are very astringent, and are used in medicine as well as for tanning.

Fl. April, May. Fr. July-Sept.

Order 3.—PASSIFLORALES.

XLI. SAMYDACEÆ.

Trees or shrubs. *Leaves* alternate, distichous, simple; stipules small, deciduous. *Flowers* regular, small, shortly pedicelled, often fascicled. *Calyx* coriaceous, persistent, free or adnate to the ovary; limb 3-7-fid. *Petals* imbricate, as many as, and alternating with, the calyx-lobes, or none. *Stamens* definite or indefinite, often with staminodes between. *Ovary* free or more or less adnate to the calyx-tube, 1-celled; style 1 or 2-5; ovules few or many, on usually 3 parietal placentas. *Fruit* a 1-celled, generally 2-5-valved, loculicidally-dehiscent capsule: seeds albuminous.

1. *Casearia*, Jacq.

Shrubs or small trees. *Leaves* entire or slightly serrate, often remotely punctate beneath; stipules small, caducous. *Flowers* greenish-yellow, small, fascicled. *Calyx-tube* short, with 4-5 imbricate lobes. *Petals* none. *Stamens* 6-15, alternating with as many staminodes or scales, usually united in a short hypogynous tube. *Ovary* superior, 1-celled, narrowed into a short style; stigma 3-fid.; ovules many, attached to 3-4 parietal placentas. *Fruit* fleshy, ovoid, usually 3-valved; seeds with a fleshy aril.

Analysis of the Species.

Leaves and branchlets glabrescent, the former elliptic	1. <i>O. graveolens</i> .
Leaves and branchlets tomentose, the former oblong	2. <i>O. tomentosa</i> .

1. **C. graveolens**, Dalz. ; Fl. Br. Ind. ii. 592 ; Brandis For. Flora 243, Ind. Trees 343 ; Gamble Man. Ind. Timb. 378. Vern. *Chilli*, Hind. ; *Nará* or *Narká*, Dún ; *Phempri*, Garhwal.

A small deciduous tree with long horizontal branches ; bark dark-grey, with white specks and a few longitudinal wrinkles. *Leaves* 4-8 by 2-5-4 in., elliptic, obtuse or shortly acute, more or less crenate, glabrous ; lateral nerves 8-10 pairs ; base rounded, sometimes acute ; petiole .2-.5 in. long ; stipules .5 in. long, deciduous. *Flowers* glabrous, numerous, clustered in the axils of the leaves ; pedicels short, jointed, pubescent below the joint. *Calyx* 5-lobed, pubescent. *Stamens* 8, alternating with hairy staminodial scales. *Fruit* 3-valved, .7-1 in. long, ellipsoid, glabrous.

Fairly common in certain parts of the DÚN FORESTS, less so on the other side of the SIWALIKS,—Tháno, Nágsidh, Ásárori, Karwápáni, Dharmáwála, Pardúni : Ránipur, Dholkhand, etc.

Wood light-yellow, even-grained and moderately hard, weighing 40-50 lbs. per c. ft., used only for fuel. The fruit is used to poison fish.

Fl. May, June. Fr. July, Aug.

2. **C. tomentosa**, Roxb. ; Fl. Br. Ind. ii. 593 ; Brandis For. Flora 243, Ind. Trees 343 ; Gamble Man. Ind. Timb. 379. Vern. *Chillá*, Hind.

A small deciduous tree with numerous horizontal branches ; bark light-grey on branches but dark-brown on old stems, peeling off in square flakes ; inner substance not fibrous. *Leaves* 3-7 by 1-7-3 in., oblong, elliptic-oblong or lanceolate, serrate or crenate, sometimes nearly entire, sub-coriaceous, tomentose, remotely gland-dotted ; base rounded or acute, often oblique ; petiole very variable in length ; stipules minute, caducous. *Flowers* tomentose, small, greenish-yellow, numerous, fascicled in the axils of leaves ; pedicels .2-.3 in. long, hairy. *Calyx* 4-5-cleft, hairy. *Stamens* 8, alternating with hairy scale-like staminodes. *Fruit* 3-valved, .7-.8 in. long, obovoid, fleshy, yellow when ripe, 6-ribbed in dry specimens ; seeds embedded in a red pulp.

Very common throughout the DÚN and SAHÁRANPUR FORESTS especially in scrub jungle and in the outskirts of Sál forests.

Wood dirty-white or yellowish, even-grained, compact, moderately hard, strong and elastic ; medullary rays fine and wavy ; heartwood not distinct ; weight about 40 lbs. per c. ft. It is sometimes used for making combs. The pounded fruit is used to poison fish.

New leaves Mar., April. Fl. Mar.-May. Fr. June, July.

Order 4.—FICOIDALES.

XLII. CACTACEÆ.

Succulent plants, sometimes arboreous, the stems very various in form. *Leaves* rarely well-developed (*Pereskia*) usually reduced to small scales with tuft of hairs, bristles or spines in their axils (areole). *Flowers* usually solitary, axillary or terminal on special tubercles, rarely paniced. *Perianth* regular or somewhat zygomorphous, usually of numerous segments, united below into a short tube; limb rotate, funnel-shaped or salver-shaped. *Stamens* numerous inserted on the perianth-tube. *Ovary* inferior, 1-celled; *ovules* many on projecting parietal placentas. *Style* 1; *stigmas* as many as the placentas, stellately spreading. *Fruit* usually a berry, 1-celled. *Seeds* many.

1. *Opuntia Dillenii*, Haw.; Fl. Br. Ind. ii. 657; Brandis Ind. Trees 346. The prickly Pear; vern. *Nagphana*, *Nagphani*.

A low spreading bush about 5 ft. high often forming dense thickets; branches flat, jointed, the joints 12-16 in. long by 6-8 in. broad, more or less obovate, undulate, dull bluish-green, bearing 4-6 prickles and tufts of numerous hairs. *Flowers* yellow, often tinged with red, from the tufts on the upper edge of the joints, bisexual, regular. *Perianth* rotate; lobes numerous, the outer ovate, acute or obtuse with membranous margins, the inner obovate, rounded mucronate. *Stamens* numerous, about half the length of perianth. *Berry* pear-shaped, truncate, depressed and with spine-bearing tubercles near the apex, deep reddish purple when ripe. It is a native of South America and has become naturalised in certain parts. It can be easily propagated by means of the joints which readily take root. Attempts have been made to utilise it as fodder for cattle in times of scarcity with apparently satisfactory results.

2. *O. monocantha*, Haw.—A branched shrub 6-8 ft. high, with bright green obovate to oblanceolate joints, areoles with 1-3 spines only; *flowers* yellow or sometimes tinged on the outside with red—cultivated in hedges in the Dun, but not common.

3. *O. Ficus-indica*, Miller.—A large bushy or sometimes erect shrub about 10 ft. high, with oblong to spatulate-oblong, dull glaucous joints, areoles small, usually spineless or with short deciduous spines; *flowers* yellow tinged with orange-red; fruit red (?) edible, about 2·3-5 in. long—occasionally cultivated in Dehra Dun.

Order 5.—UMBELLALES.

XLIII. ARALIACEÆ

Soft-wooded trees or shrubs, sometimes scandent. *Leaves* alternate, simple or compound, long-petioled; stipules adnate to the petiole, or absent. *Flowers* regular, small, sometimes polygamous, in umbels, racemes or paniced heads: bracts and bracteoles small or conspicuous. *Calyx-tube* adnate to the ovary; limb short, truncate or with small teeth. *Petals* usually 5, valvate or sub-imbricate, deciduous. *Stamens* as many as, and alternating with, the petals, inserted on an epigynous disk; filaments inflexed; anthers versatile. *Ovary* inferior, 2- or more-celled; styles as many as the cells; ovules solitary, pendulous. *Fruit* a drupe or a berry, sometimes 1-celled by suppression.

Analysis of the Genera.

Leaves simply or compoundly pinnate or digitate.

Petals imbricate in bud.

Styles free

Styles combined

1. ARALIA.

2. PENTAPANAX.

Petals valvate in bud.

Leaves digitate.

Ovary 5-6-celled; styles 5-6

Ovary 2-celled; styles 2, combined

3. HEPTAPLEURUM.

5. BRASSAIOPSIS.

Leaves tripinnate

4. ~~HEPTAPANAX~~.

Leaves simple (petals valvate; styles combined)

6. HEDERA.

1. **Aralia**, Linn.

1. **A. cachemirica**, Dene. ; Fl. Br. Ind. ii. 722 ; Brandis For. Flora 248, Ind. Trees 351 ; Gamble Man. Ind. Timb. 384. Vern. *Akhōtā*, Jaunsar.

A large perennial herb, 5-10 ft. high. *Leaves* 2-pinnate, or 3-pinnate, 1·5-3 ft. long. *Leaflets* 3-9 on each pinna (secondary pinna if 3-pinnate), 3·5 by 1·5-2·5 in., ovate or oblong-lanceolate, long-acuminate, obliquely rounded or cordate at the base, unequal-sided, doubly serrate, with distant short hairs above, generally hispid on the nerves beneath ; rachises hispid ; petiolules 0·1-3 in. ; stipules ·5-1 in. long, erect, fimbriate. *Flowers* in umbels, which are disposed in large terminal panicles often about a foot long. *Petals* 5, ovate, imbricate. *Stamens* 5. *Ovary* usually 5-celled ; styles 5, free above the base. *Fruit* with 5 stones.

Extremely common in JAUN SAR and TEHRI-GARHWAL, above 6,000 ft., generally in shady ravines.

New shoots April. Fl. June-Oct.

2. **Pentapanax**, Seem.

1. **P. parasiticum**, Seem. ; Fl. Br. Ind. ii. 724 ; Brandis For. Flora 248, Ind. Trees 349 ; Gamble Man. Ind. Timb. 384.

A scandent soft-wooded shrub with rootlets at the nodes. *Leaves* simply imparipinnate, 6-10 in. long. *Leaflets* 5, 2-3 by 1·1-7 in., ovate-lanceolate, entire, rounded or sub-acute at the base, coriaceous, glabrous, glaucous beneath ; petiolules 0·1 in. *Umbels* 2-8 in a short panicle ; pedicels ·5-7 in. long, jointed below the flowers, glabrous. *Flowers* pentamerous. *Petals* imbricate. *Styles* 5, long, combined to near the top. *Fruit* small, sub-globose, obscurely 5-angled.

MUSSOORIE HILLS. Very scarce.

3. **Heptapleurum**, Gærtn.

1. **H. venulosum**, Seem. ; Fl. Br. Ind. ii. 729 ; Brandis For. Flora 249, Ind. Trees 348 ; Gamble Man. Ind. Timb. 386. Vern. *Kāth Semal*, *Kot Semal*, Dún.

A soft-wooded scandent shrub attaching itself to trees by adventitious rootlets. *Leaves* digitate ; *petiole* 6-9 in. long ; stipules ·3-·5 in. long, connate in the angle between the branch and the petiole, amplexicaul. *Leaflets* 5-7, 4·8 by 2·3-5 in., the middle one largest elliptic-oblong or lanceolate, acuminate, entire, sub-acute or rounded

at the base, coriaceous, glabrous, shining above : petioles 1-2 in. long. *Flowers* about 2 in. diam., cream-coloured, umbelled : umbels in large twice-compound terminal panicles ; pedicels 1-1.3 in. : bracts woolly, caducous. *Petals* 5-6, valvate. *Stamens* as many as the petals. *Ovary* 5-6-celled ; styles 5-6, small, free. *Berry* 5-celled, 3-4 in. diam., globose, smooth, yellow.

Fairly common in the DÚN : Lachiwála, Dúdhli, Mothronwála, Jhájrá, etc. Also found in the Tons Valley, JAUNSAAR and TEHRÍ GARHWAL.

Fl. Jan., Feb. Fr. April, May.

4. *Heteropanax*, Seem.

1. *H. fragrans*, Seem. ; Fl. Br. Ind. ii. 734 ; Brandis For. Flora 249, Ind. Trees 352 ; Gamble Man. Ind. Timb. 386. Vern. *Tarlá*, Dún (i.e., larger than *Tarlu*—*Oroxylum indicum*, Vent.).

A small soft-wooded tree ; bark soft, even, dark brownish-grey. *Leaves* tripinnate, 2-4 ft. long ; petiole with a swollen base ; stipules minute. *Leaflets* 3-5 by 1.7-3 in., ovate or elliptic, shortly acuminate, narrowed at the base, entire, glabrous ; petioles 0.4 in. long. *Panicles* about 3 ft. long, lowermost branches 1-1.5 ft., branchlets or umbel-bearing racemes 2-3 in., umbels sub-capitate. *Flowers* 2-3 in. diam., polygamous, small, yellow, fragrant. *Calyx* nearly truncate. *Petals* 5, valvate. *Stamens* 5. *Ovary* 2-celled ; styles 2, distinct, filiform. *Fruit* compressed, 2-3 in. long, 3-4 in. broad, 1 in. thick ; seeds 2, flat, orbicular.

Fairly common in the DÚN and also in the SAHÁRANPUR SIWÁLIKS : Kánsráo Pass, Tháno, Lachiwála, Dúdhli, Phandowála, Karwápáni ; Sháhjahánpur Ráu, etc. The tree is likely to be mistaken, when not in flower and fruit, for *Oroxylum indicum*, Vent., which, however, has opposite leaves.

The leaves are lopped for cattle-fodder, and the Eri silkworm of Assam is sometimes fed on them.

Fl. Jan., Feb. Fr. Feb., Mar.

5. *Brassaiopsis*, Dcne. & Planch.

1. *B. aculeata*, Seem. ; Fl. Br. Ind. ii. 738 ; Brandis Ind. Trees 353.

A small tree armed with stout conical prickles ; young shoots rusty-stellate-tomentose. *Leaves* digitate 5-7-foliate ; *leaflets* up to 9 in. long by 2.8 in. broad, subsessile, narrowly lanceolate-obovate or oblanceolate, acuminate, attenuate at the base, softly herbaceous,

more or less stellate-tomentose on both surfaces; common petiole 4-15 in. long, hispid at the apex; *stipules* connate with the petiole, not prominent. *Flowers* often polygamous, in umbels arranged in large, compound panicles; *bracts* at the base of the branches, ovate, persistent; *pedicels* .3-.4 in. not jointed under the flower, from a cluster of lanceolate, hairy, persistent bracteoles. *Calyx* 5-toothed. *Petals* 5, valvate, pale-yellowish-green. *Stamens* 5. *Ovary* 2-celled; styles 2, united. Fruit globose, .25 in. diam. subdidymous.

Mussoorie; Sahansradhara;—usually in shady and moist ravines not common. Fl. Nov.-Dec.

6. *Hedera*, Linn.

1. *H. Helix*, Linn.; Fl. Br. Ind. ii. 739; Brandis For. Flora 248, Ind. Trees 349; Gamble Man. Ind. Timb. 387. The Ivy. Vern. *Mithiári*, Jaunsar.

A large evergreen woody climber adhering to trees, rocks or walls by numerous fine adventitious rootlets. *Leaves* simple, extremely variable in size and shape, generally 2-5 in. long, often variously lobed, leathery, dark-green and shining above; margins entire; base cordate rounded or cuneate; petiole slender, .5-2.5 in. long. *Flowers* polygamous, yellowish-green, in pedunculate globose umbels, which again are arranged in sub-corymbose panicles; peduncles 1-2 in., pedicels .5-.8 in. long, both clothed with minute stellate scales. *Calyx* 5-toothed or nearly entire. *Petals* 5, valvate. *Stamens* 5. *Ovary* 5-celled; styles connate in a short column. *Fruit* .25-.3 in. diam., globose, yellow, turning black when fully ripe, shining; seeds 3-4, ovoid.

Common in JAUNSAR and TEHRI-GARHWAL, up to 9,500 ft. Also found in the Nakraunda, Mothronwála and Kánsráe swamps in the DÚN, 1,400-1,800 ft.

Wood light-grey or yellow, soft and porous; annual rings distinct; weight 35 lbs. per c. ft. The leaves are a favourite fodder for sheep

Fl. Oct.-April. Fr. Jan.-June.

XLIV. CORNACEÆ.

Shrubs or trees. *Leaves* simple, opposite or alternate, usually entire, frequently unequal at the base; stipules none. *Flowers* regular, in axillary or terminal heads:

cymes of panicles. *Calyx-tube* adnate to the ovary; limb truncate or 4-5-toothed, persistent. *Petals* 4-5, valvate, or none. *Stamens* inserted with the petals and generally equal to them in number. *Disk* epigynous. *Ovary* inferior, 1-4-celled; style single; ovules pendulous, usually solitary. *Fruit* usually a succulent drupe with a 1-4-celled kernel, less often with two distinct stones; seeds pendulous, oblong, albuminous.

Analysis of the Genera.

Leaves alternate; petals, anthers and style long.	
Flowers fasciculate; stamens numerous	1. ALANGIUM.
Flowers paniculate; stamens as many as the petals.	2. MARLEA.
Leaves generally opposite; petals, anthers and style short	3. CORNUS.

1. *Alangium*, Lamk.

1. **A. Lamarckii**, Thwaites; Fl. Br. Ind. ii. 741; Brandis For. Flora 250, Ind. Trees 354; Gamble Man. Ind. Timb. 389. Vern. *Akolá*, *Ankora*, Hind.; *Bismár*, Saháranpur.

A shrub or small tree, almost evergreen; branchlets spinescent; bark grey. *Leaves* alternate, simple, 3-6 in. long, membranous varying in shape from linear oblong to elliptic, obtuse acute or acuminate, glabrous or nearly so; lateral nerves 5-8, fine; base acute or rounded; petiole 2-5 in. long, hairy. *Flowers* 6-8 in. long, white, fragrant, solitary or fascicled; inflorescence and calyx woolly. *Calyx* minutely 6-10-toothed. *Petals* 5-10, nearly 1 in. long, silky outside. *Stamens* up to 30, short, hairy; anthers very long. *Ovary* inferior, 1-celled; style long, filiform. *Fruit* a berry, 7 in. long, ellipsoidal, crowned with the enlarged calyx-limb, quite smooth, black outside when ripe, filled with a red pulp; endocarp bony; seeds oblong.

Occasionally met with along the foot of the SAHÁRANPUR SIWÁLIKS: Ráunli, Ránipur, Jawálápur, etc. Not found in the DÚN.

Wood light-brown, fine- and smooth-grained, very tough and strong; weight 45-56 lbs. per c. ft. Used for pestles for oil-mills, wooden cattle-bells, carrying-poles and yokes. The bitter bark of the roots is used in country medicine, and the leaves often as poultice. The fruit is eaten, and an oil is extracted from the seeds which is used in medicine and also for burning.

New leaves April, May. Fl. Feb.-April. Fr. May-Aug.

2. Marlea, Roxb.

1. *M. begoniæfolia*, Roxb. : Fl. Br. Ind. ii. 743; Brandis For. Flora 251, Ind. Trees 355; Gamble Man. Ind. Timb. 389. Vern. *Bhut Kainju*, Jaunsar; *Garh Kimu*, Dún.

A small tree with smooth grey bark; branches horizontal; young parts pubescent. *Leaves* alternate, simple, 3-10 in. long, varying from orbicular to broad-oblong, acuminate, distantly angular-lobed or quite entire, usually glabrous above when mature; base unequal, from cuneate to deeply cordate, with 3-5 basal nerves; petiole 1-1.5 in. long. *Flowers* bracteate, .6-.9 in. long, 2-sexual, white, in axillary dichotomously-compound cymes. *Calyx* shortly toothed. *Petals* usually 6-8, strap-shaped .5-.7 in. long, white, slightly hairy. *Stamens* 6-8; filaments short, hairy; anthers .4 in. long, linear. *Ovary* usually 2-celled; ovules 2, pendulous; style long, glabrous; stigma capitate. *Fruit* a drupe, .3-.5 in long, ovoid, obscurely ribbed, glabrous, crowned with the persistent calyx-limb still encircling the disk; seeds oblong, compressed.

Valleys up to 5,000 ft. in JAUNSAAR and TEHRI-GARHWAL, and in the OUTER HIMALAYAN HILLS; Binálgádh, Thádiár; Páléd, above Rájpur, etc. Also in the Nakraunda swamp in the DÚN, 1,900 ft.

The wood is even-grained, white and soft, used in building huts in Sylhet. The leaves are given as fodder to sheep and cattle. Lac is sometimes grown on it in Kámrúp, ASSAM.

Fl. Mar.-May. Fr. July-Oct.

3. Cornus, Linn.

Trees or shrubs. *Leaves* entire, usually opposite. *Flowers* small, bisexual, in cymes or heads. *Calyx*

GAMOPETALÆ.

Series i.—*Epigynæ.*

Order 1.—*RUBIALES.*

XLV. CAPRIFOLIACEÆ.

SHRUBS or small trees, rarely herbs. *Leaves* opposite or ternate ; stipules generally absent. *Flowers* bisexual, regular or irregular. *Calyx-tube* adnate to the ovary ; limb 3-5-lobed. *Corolla* gamopetalous, often 2-lipped ; lobes 5, imbricate in bud. *Stamens* 5, rarely fewer or more, inserted on the corolla-tube between the lobes ; anthers versatile. *Ovary* inferior, 1-6-celled ; ovules solitary and pendulous, or several on axile placentas. *Fruit* a berry or a drupe, rarely a capsule ; seeds with copious fleshy albumen.

Analysis of the Genera.

Corolla-tube straight, limb not lipped.

Fruit 1-seeded ; stem solid.

Leaves generally toothed or serrate ;

calyx-lobes not elongated . . . 1. **VIBURNUM.**

Leaves entire ; calyx-lobes elongated

and feathery 2. **ABELIA.**

Fruit many-seeded ; stem hollow .

4. **LEYCESTERIA.**

Corolla-tube oblique, limb more or less lipped (fruit many-seeded ; leaves

entire) 3. **LONICERA.**

1. **Viburnum**, Linn.

Shrubs or small trees. *Leaves* simple, opposite, sometimes ternate, generally serrate or toothed. *Flowers* white or pink, in terminal or axillary corymbs or panicles. *Calyx-limb* short, 5-toothed. *Corolla* 5-lobed. *Stamens* 5. *Ovary* 1-3-celled with 1 pendulous ovule in each cell; style short, or stigma sessile. *Fruit* a drupe, usually 1-celled, 1-seeded.

Analysis of the Species.

Leaves entire or crenate.

Leaves ovate or orbicular; lower surface tomentose; calyx limb 5-toothed 1. *V. cotinifolium*.

Leaves oblong-lanceolate, glabrous; calyx-limb obsolete 3. *V. coriaceum*.

Leaves sharply toothed.

Flowers not more than .2 in. long corolla rotate 2. *V. stellulatum*.

Flowers .5-.7 in. long; corolla tubular, funnel-shaped 4. *V. nervosum*.

1. ***V. cotinifolium***, Don. : Fl. Br. Ind. iii. 3; Brandis For. Flora 358, Ind. Trees 361; Gamble Man. Ind. Timb. 393. Vern. *Bhutnoi*, Jaunsar.

A large deciduous shrub with greyish bark. *Leaves* 3-3.5 in. long, ovate elliptic or orbicular, obtuse, crenulate or nearly entire, rugose, woolly tomentose beneath; base obtuse or subcordate; lateral nerves 5-6 pairs, branching. *Flowers* generally in dense terminal corymbs which are 3-4 in. diam.; bracteoles linear. *Calyx-limb* 5-toothed. *Corolla-tube* .2 in. long, turbinate, white tinged with pink; lobes round. *Style* very short, conical. *Drupe* .3 in. long, oblong, compressed, ribbed, red.

Abundant in JAUNSAAR and TEHRI-GARHWAL, above 4,000 ft. affecting open sunny aspects.

Wood white, hard and close-grained. The ripe fruit is eaten.

Fl. April-June. Fr. July, Aug.

2. ***V. stellulatum***, Wall. : Fl. Br. Ind. iii. 4; Brandis For. Flora 258, 576, Ind. Trees 361; Gamble Man. Ind. Timb. 394. Vern. *Richhoi*, Jaunsar. ½

A shrub with long branches, and dark-grey almost black bark. *Leaves* 3-4 by 1.5-2 in., ovate or ovate-lanceolate, long-acuminate, distantly sharp-toothed, membranous, glabrous above, sparingly stellulate-pubescent beneath; base rounded or subacute; petiole .3-1 in. long. *Flowers* small, very numerous, in large bracteate umbellate cyme-bearing terminal corymbs. *Calyx-tube* stellately hairy. *Corolla* rotate, white, pubescent; lobes round. *Drupe* .25 by .2 in., broadly oblong, compressed, bright-red when ripe.

Fairly common in JAUN SAR and TEHRI-GARHWAL, above 6,000 ft., generally in cool shady localities: Deoban, Mundali; Deotá, etc.

Walking-sticks are often made of the branches. The acid fruit is eaten.

Fl. July, Aug. Fr. Sept., Oct.

3. **V. coriaceum**, Bl.; Fl. Br. Ind. iii. 5; Brandis For. Flora 259, Ind. Trees 362; Gamble Man. Ind. Timb. 394. Vern. *Rashniá*, Jaunsar.

A shrub or small tree with grey bark. *Leaves* 4-9 by 1.5-2.5 in., oblong-lanceolate, acuminate, entire, thickly coriaceous, glabrous; lateral nerves 3-4 pairs, arcuate; petiole .5-1 in. long. *Flowers* .25 in. long, numerous, in terminal umbellate corymbs; bracts 0. *Calyx-limb* obsolete, glabrous. *Corolla* white, tubular. *Drupe* .2 in. long, 1-celled, black.

JAUN SAR and TEHRI-GARHWAL, 4,-7,000 ft.; also the OUTER HIMALAYA; Korwá forest, Kathián, Moltá; both slopes of the Mussoorie Hill, Málkót Forest, etc.

Wood white, hard, close-grained, weighing 50 lbs. per c. ft. An oil is said to be extracted from the seeds in Nepal.

Fl. May, June. Fr. July, Aug.

4. **V. nervosum**, Don.; Fl. Br. Ind. iii. 8; Brandis For. Flora 259, Ind. Trees 363; Gamble Man. Ind. Timb. 395. Vern. *Tirnoi*, Jaunsar.

A shrub with stout grey or brownish branches. *Leaves* 2.5-4 by 1.3-1.5 in., elliptic-oblong, acute, serrate, glabrous above, hairy on the nerves beneath; lateral nerves 8-10 pairs, prominent, closely parallel; base cuneate; petiole .3-.6 in. long. *Panicles* compact, or lax, silky; branches short. *Flowers* .5-.7 in. long. *Calyx-tube* glabrous. *Corolla* tubular-funnel-shaped; lobes elliptic, light-rosy. *Stamens* in 2 series. 2 above and 3 below. *Drupe* ellipsoid, up to .3-.5 in. long.

JAUN SAR and TEHRI-GARHWAL, above 9,000 ft.; Deoban Mundali; Deotá, etc.

Fl. April, May. Fr. May, July.

V. foetens, Dene. ; Fl. Br. Ind. iii. 8 ; is said to differ from *V. nervosum*, Don. in the flowers being smaller and the leaves pubescent beneath. I doubt if they are really distinct.

2. **Abelia**, R. Br.

1. **A. triflora**, R. Br. ; Fl. Br. Ind. iii. 9 ; Brand's For. Flora 257, Ind. Trees 360 ; Gamble Man. Ind. Timb. 396. Vern. *Máli*, *Málé*, Jaunsar.

A large shrub ; branches long, fluted ; branchlets slender and often drooping ; bark grey. *Leaves* 2-3 by .7-1.3 in., ovate-lanceolate, hairy all over or only along the margins and the midrib, finely reticulate ; petioles short, often connate at the base. *Flowers* scented, .4-.6 in. long, usually 3 together in dense bracteate heads or cymes ; bracts and bracteoles foliaceous. *Calyx-lobes* .5-1 in. long in fruit, feathery, with a distinct midrib. *Corolla* tubular, funnel-shaped or with a wide mouth, pinkish-white. *Fruit* .2-.3 in. long, 1-seeded, linear-oblong, dry.

Fairly common in JAUNSAR and TEHRI-GARHWAL, above 4,000 ft., frequently on calcareous soils : Deoban, Bodyár, Mundáli, Dháragádh ; Bámsu, Deotá, etc.

Wood bluish-white, hard, close- and even-grained ; weight 65 lbs. per c. ft. Walking-sticks are often made of the branches, and the leaves are browsed by goats.

Fl. May-July. Fr. July-Oct.

3. **Lonicera**, Linn.

Shrubs, erect or scandent. *Leaves* opposite, entire. *Flowers* in peduncled pairs, often connate by their ovaries, supported by bracts and bracteoles ; peduncles axillary or subterminal. *Calyx-tube* ovoid ; limb short, 5-toothed. *Corolla* tubular, limb oblique or 2-lipped, 5-lobed. *Stamens* 5. *Ovary* 2-3-celled ; ovules many in each cell, in double rows ; style slender, stigma capitate. *Fruit* a fleshy berry, often two connate into one, 2-3-celled ; seeds few in each cell ; albumen fleshy.

Analysis of the Species.

Corolla not distinctly 2-lipped

Leaves oblong ; fruit black . . . 1. *L. purpurascens*.Leaves lanceolate ; fruit red . . . 2. *L. angustifolia*.

Corolla distinctly 2-lipped.

Fruits free.

Peduncles extremely short . . . 3. *L. quinquelocularis*.Peduncles 1-2 in. long . . . 5. *L. alpigena*.Fruits confluent . . . 4. *L. orientalis*.

1. *L. purpurascens*, Hook. f. & T.; Fl. Br. Ind. iii. 12 ; Brandis For. Flora 255, Ind. Trees 359 ; Gamble Man. Ind. Timb. 396.

A small shrub : branches dark-grey ; bark peeling off in thin shreds. *Leaves* 1·5 by ·5 in. or less, oblong or obovate-oblong, pilose or glabrescent above, usually villous beneath. *Bracts* linear. *Corolla* ·5-·7 in. long, hairy, purple, funnel-shaped. *Style* hairy. *Fruit* globose, black when ripe.

TEHRI-GARHWAL, above 10,000 ft. ; Rikhshin, Chánsil, etc.

Fl. May, June.

2. *L. angustifolia*, Wall. ; Fl. Br. Ind. iii. 13 ; Brandis For. Flora 255, Ind. Trees 359 ; Gamble Man. Ind. Timb. 397. Vern. *Geáng*, *Chalú*, *Pirkú*, *Banchulú*, Jaunsar.

A small shrub with smooth grey bark which exfoliates in long papery flakes. *Leaves* 1·5 by ·5 in., lanceolate or oblong-lanceolate, pale and nearly glabrous beneath. *Flowers* in pairs on slender axillary peduncles ·5-1 in. long ; bracts linear ; bracteoles connate, enclosing the confluent ovaries. *Corolla* white tinged with rose, ·2-·4 in. long, scented ; lobes subequal. *Style* short, glabrous. *Fruit* confluent, globose, bright ruby-colour and translucent when ripe ; seeds few.

Common in JAUN SAR and TEHRI-GARHWAL, above 6,000 ft.

Wood hard and very close-grained. Good walking-sticks can be made of the branches, if found long and thick enough. The fruit is sweetish and is greedily eaten by the hill people.

Fl. May, June. Fr. July, Aug.

3. *L. quinquelocularis*, Hardwick ; Fl. Br. Ind. iii. 14 ; Brandis For. Flora 255, Ind. Trees 359 ; Gamble Man. Ind. Timb. 397. The Himalayan Honey-suckle. Vern. *Taknoi*, Jaunsar.

A large shrub, occasionally a small tree; bark grey, with longitudinal fissures, peeling off in long shreds; branchlets pubescent. *Leaves* 1.5-3 by 1.2 in., obovate or ovate-lanceolate, acute or obtuse at either end, glabrate above, pilose beneath. *Flowers* clustered, axillary; peduncles extremely short; bracts linear, ciliate; bracteoles obtuse, connate at the base. *Calyx-limb* cup-shaped, hairy. *Corolla* .7-1.2 in. long, white, fading into pale-yellow, hairy. *Style* hairy, exserted. *Berries* not connate, brownish-black when ripe.

Fairly common throughout the OUTER HIMALAYA, JAUNSAIR and TEHRI-GARHWAL, 2,500-9,000 ft.

Wood greyish-white, hard and close-grained; takes a fine polish, but is used chiefly for fuel; weight 52 lbs. per c. ft. Cattle are fed on the leaves. The branches are sometimes used for walking-sticks.

Fl. May, June. Fr. July, Aug.

4. *L. orientalis*, Lamk.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256, Ind. Trees 359; Gamble Man. Ind. Timb. 398. Vern. *Taknoi*, Jaunsar.

A large shrub with compressed horizontal branches; bark peeling off in thin shreds. *Leaves* 2-4 by 1.5-2.5 in., ovate or ovate-lanceolate, acute at both ends, mucronate, more or less pubescent beneath; nerves 10-12 pairs, slender. *Peduncles* .5-1 in. long, thickened upwards; bracts linear-lanceolate; bracteoles small and rounded, or none. *Calyx-lobes* linear-lanceolate. *Corolla* pink, nearly glabrous outside, deeply 2-lipped, gibbous at the base; tube very short. *Style* hairy. *Berries* confluent, black when ripe.

JAUNSAIR and TEHRI-GARHWAL, above 6,000 ft.; Mundáli, Deoban, etc.

Fl. June. Fr. July, Aug.

5. *L. alpigena*, Linn.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256, Ind. Trees 358; Gamble Man. Ind. Timb. 398. Vern. *Phulor*, Jaunsar.

A shrub with pubescent branchlets, and grey-brown bark which peels off in irregular papery flakes. *Leaves* 3-4 by 1.2 in. elliptic-oblong or ovate-lanceolate, long-acuminate, glabrate above, pilose beneath; base rounded or cuneate; nerves 6-8 pairs, slanting. *Peduncles* 1-2 in. long, thickened upwards; bracts lanceolate or linear; bracteoles small. *Calyx-tube* pubescent; limb short. *Corolla* glandular-hairy, very gibbous at the base. *Fruit* not connate.

JAUNSAIR and TEHRI-GARHWAL, above 8,000 ft., not common; Bájámára, Mundáli; Deotá, Rikshshin, etc.

Fl. May, June. Fr. July, Aug.

4. *Leycesteria*, Wall.

1. *L. formosa*, Wall.; Fl. Br. Ind. iii. 16; Brandis For. Flora 56, Ind. Trees 360; Gamble Man. Ind. Timb. 398. Vern. *Bhuj-nali*, Jaunsar; *Dánda Bhekar*, Garhwal.

A bushy shrub (perennial herb ?) with grey stems and deep-green hollow branches, usually from near the base. *Leaves* opposite, 2-5 by 1-3 in., ovate or ovate-lanceolate, long-acuminate, entire or with the margins irregularly uneven, membranous, glaucous or puberulous beneath, glabrous or slightly scabrous above; base from subacute to cordate; petioles .2-1 in. long, connate at the base. *Flowers* about 1 in. long, sessile, in axillary or terminal bracteate whorls; bracts sessile, greenish-purple, ovate or ovate-lanceolate; generally connate at the base; bracteoles very variable. *Calyx-lobes* 5, unequal, persistent. *Corolla* funnel-shaped, swollen at the base, red or white with a purplish tinge. *Fruit* a fleshy berry, .5 in. long, subglobose, dark-purple when fully ripe, glandular-hairy, usually 5-celled, many-seeded. *Seeds* round and compressed.

Fairly common in cool shady forests in JAUN SAR: Deoban Mundáli, etc.

The hollow stems are made into toy flutes and trumpets by Jaunsari shepherd boys.

Fl. June, July. Fr. July, Aug.

XLVI. RUBIACEÆ.

Trees, shrubs or herbs. *Leaves* simple, opposite or whorled, entire, stipulate; stipules inter- or intrapetiolar, free or adnate to the petioles, or forming a sheath round the stem. *Inflorescence* various. *Calyx-tube* adnate to the ovary; limb entire or toothed. *Corolla* gamopetalous, regular; lobes usually 4-5, valvate, imbricate or contorted in the bud. *Stamens* as many as the corolla-lobes and alternating with them, inserted on the corolla-tube. *Ovary* inferior, 2- or more-celled, rarely 1-celled; ovules 1 or more in each cell, anatropous. *Fruit* various; seeds usually with a fleshy or horny albumen.

Analysis of the Genera.

Fruit capsular (in *Paederia* of 2 pyrenes which separate from a fragile epicarp).

Ovary 2-celled, cells many-seeded.

Corolla-lobes valvate in bud.

Flowers in dense globose heads.

Trees.

Calyx 5-lobed; no bract-like leaves

1. ADINA.

Calyx truncate; inflorescence supported by bract-like leaves

2. MITRAGYNA.

Climbing shrubs; flowers without bracteoles

3. UNCARIA.

Flowers not in globose heads.

An epiphytic shrub; style 2-fid

4. HYMENOPOGON.

A tree; style entire

5. HYMENODICTYON.

Corolla-lobes imbricate in bud; flowers in large terminal panicles

6. WENDLANDIA.

Ovary 2-celled, cells 1-seeded

11. PÆDERIA.

Ovary 5-celled, seeds solitary in each cell; corolla lobes valvate in bud.

Capsule 1-celled, 5-valved only at the top; bracteoles free

12. HAMILTONIA.

Capsule 5-celled to the base; bracteoles connate

13. LEPTODERMIS.

Fruit indehiscent; ovary 2-celled; corolla lobes twisted in bud.

Fruit with a pair of 1-seeded crustaceous pyrenes.

Flowers in trichotomous corymbose panicles

9. PAVETTA.

Flowers axillary, fascicled or solitary.

10. COFFEA.

Fruit fleshy, seeds more than 1 in each cell. (Flowers axillary, fascicled or solitary).

Ovary 2-celled, placentas on the septum

7. RANDIA.

Ovary 1-celled; placentas parietal

8. GARDENIA.

1. *Adina*, Salisb.

1. *A. cordifolia*, Hook. f.; Fl. Br. Ind. iii. 24; Brandis For. Flora 263, Ind. Trees 368; Gamble. Man. Ind. Timb. 401. Vern. *Haldu*, Hind.

A large deciduous tree, often buttressed; bark grey or brownish-grey, rough, inner substance reddish-brown with streaks of white. *Leaves* opposite, 4-9 in. diam., orbicular, cordate, abruptly acuminate, coriaceous, glabrate above, pubescent beneath; petiole 3-4 in. long; stipules 5-8 in. long, triangular, elliptic or obovate, brown, concealing the uppermost pair of leaf-buds. *Flowers* yellow, downy, bracteolate, in globose peduncled heads which are 7-1 in. diam.; receptacle hairy; peduncles axillary, 2-4 in. long, usually with one head. *Calyx-tube* 5-angled; limb 5-lobed. *Corolla* trumpet-shaped; tube long, glabrous inside; lobes valvate. *Stamens* 5, inserted in the mouth of the corolla-tube; filaments short. *Ovary* 2-celled; ovules many in each cell; style filiform, long-exserted. *Capsules* 200-300 in each head, of 2 dehiscent cocci, dry, many-seeded; seeds oblong, winged, very minute.

A common tree throughout the DŪN and SAHĀRANPUR FORESTS and in the OUTER HIMALAYA, usually overtopping all other trees, and can be easily recognised from a distance by its dark-green umbrageous crown.

Wood yellow when fresh-cut, afterwards changing into reddish-brown, even-grained, compact, moderately hard; weight 40-50 lbs. per c. ft.; heartwood and annual rings not distinct. It seasons well, works easily, takes a good polish and is fairly durable. Used for construction, furniture and agricultural implements. In the SAHĀRANPUR DIVISION there is a special demand for good trees, which are carted down to Sahāranpur to be made into combs, writing-tablets and ornamental platters.

Leafless for a short time in May. Fl. June, July. Seeds ripen in the cold season.

2. *Mitragyna*, Korth (*Stephegyne*, Korth.)

1. *M. parvifolia*, Korth.; Syn.—*Stephegyne parvifolia* Korth.; Fl. Br. Ind. iii. 25; Brandis For. Flora 262, Ind. Trees 360; Gamble Man. Ind. Timb. 403. Vern. *Kāem*, Hind.; *Phaldu*, Garhwal.

A large deciduous tree; trunk irregularly shaped, often buttressed; bark brownish- or greenish-grey, smooth, with shallow depressions left by exfoliating scales. *Leaves* opposite, very variable, 2-6 in. long, orbicular, oblong, ovate or obovate, coriaceous, glabrous or pubescent; lateral nerves 6-8 pairs, oblique; base cuneate to subcordate; stipules obovate, pale, membranous. *Flowers* white or light-yellow, bracteolate, glabrous inside, in globose heads about 1 in. diam. *Peduncles* 5-3 in. long, simple or trichotomously divided to form usually 3-headed panicles, supported by a pair of bract-like oblong leaves narrowed into a long slender petiole; bract

teoles spatulate, minute. *Calyx-tube* short; limb truncate or minutely 5-toothed. *Corolla* trumpet-shaped; lobes 5, valvate. *Stamens* 5, inserted on the throat of the corolla-tube; filaments short. *Ovary* 2-celled; ovules many in each cell; style filiform, much exserted; stigma cylindrical, with a concave base. *Capsules* 100-150 in each head, dry, .12 in. long, of 2 dehiscent cocci; seeds many, winged, minute.

Abundant in the SAHÁRANPUR FORESTS, and fairly common in the DÚN. Some individuals attain enormous sizes, e.g., those in the camping-ground at Dholkhand.

Wood light pinkish-brown, close- and fine-grained, generally harder than that of *Adina cordifolia*; weight about 42 lbs. per c. ft. Heartwood not distinct; rings visible. Used generally for the same purposes as *Haltu*. The leaves are used for fodder.

Leafless Apr., May. Fl. June, July. Fr. Nov.-Jan.

Allied to the two preceding trees is *Anthocephalus Cadamba*, Miq.; Fl. Br. Ind. iii. 23. Vern. *Meo*, E. DÚN, *Kadamb*, Hind.;—a large handsome tree, a few individuals of which, probably originally planted, are found near the old Khairi fort, E. DÚN. *Leaves* resembling those of *Holarrhena antidysenterica*. *Flower-heads* about 2 in. diam. The ripe fruit is acid and is eaten raw or cooked.

3. *Uncaria*, Schreb.

U. pilosa, Roxb.; Fl. Br. Ind. iii. 32; Brandis Ind. Trees, 371; Gamble Man. Ind. Timb. 405.

A large evergreen scandent shrub: branchlets, petioles, undersurface of leaves and peduncles tomentose. *Leaves* 4-6 in. long by 2-2.5 in. broad, ovate or ovate-oblong, caudate-acuminate, rounded at the base, sub-membranous, slightly scaberulous above, pubescent beneath; *petiole* .1-.2 in. long; *stipules* 2-partite, the segments recurved. *Flowers* in globose axillary peduncled ebracteolate heads; *peduncle* 1-2 in. long, gradually narrowed from a stout base, and with a whorl of about 6 linear-lanceolate bracts above the middle; the sterile peduncles transformed into hooked tendrils. *Heads* 1-1.5 in. diam. *Calyx* 5-lobed, tomentose, lobes linear, about as long as the tube. *Corolla* funnel-shaped, yellow, hairy, tube slender. *Stamens* 5, on the throat of the corolla; filaments short; *anthers* with two basal bristles. *Ovary* 2-celled; *ovules* many; *stigma* capitate. *Fruit* a head of capsules; *capsules* sessile, .25-.3 in. long, ribbed, slightly hairy, crowned by the linear calyx-lobes.

Dehra Dun in ravines.

Fl. Apr.-May. Fr. Cold season.

4. *Hymenopogon*, Wall.

H. parasiticus, Wall. : Fl. Br. Ind. iii. 34, Brandis Ind. Trees 372.

A small epiphytic shrub. *Leaves* crowded towards the ends of branches, 3-12 in. long by 2-4 in. broad, oblanceolate, entire shortly acuminate, membranous, narrowed into a short petiole, more or less pubescent on both surfaces; secondary nerves 15-20 pairs; *stipules* ovate, acute, persistent, about .3 in. long. *Flowers* creamy-white, in terminal trichotomous corymbs about half as long as the leaves; *bracts* foliaceous, 1.5-3 in. long, narrow oblong or lanceolate, acute or obtuse, white, reticulated, long-petioled. *Calyx-tube* 1 in. long; *lobes* 5, linear about .2 in. long, persistent. *Corolla* salver-shaped, 1.5 in. long; *tube* slender, lobes 5, villous, valvate in bud. *Stamens* 5, inserted below the throat of corolla. *Ovary* 2-celled; *ovules* many; *style* filiform, 2-fid; *stigmas* 2, linear. *Capsule* membranous, .7 in. long, turbinate, crowned with the linear calyx-lobes, septically 2-valved.

Chakrata; Mussoorie; as an epiphyte on trees.

Fl. July-Aug.

5. *Hymenodictyon*, Wall.

1. *H. excelsum*, Wall. : Fl. Br. Ind. iii. 35; Brandis For. Flora 267, Ind. Trees 371; Gamble Man. Ind. Timb. 406. Vern. *Bhulan*, Dún; *Kukurkát*, Hind.

A large deciduous tree; bark soft, brownish-grey, smooth on branches and poles, corky and furrowed on the stems of mature trees. *Leaves* opposite, 4-10 by 3-5 in., elliptic or obovate-oblong, acuminate, often obtuse or rounded, membranous, pubescent; lateral nerves 7-10 pairs; base acute; petiole 1-3 in.; *stipules* oblong with a broad base, caducous, usually glandular-serrate; floral leaves long-petioled, strongly nerved. *Flowers* about .2 in. long, white, fragrant, in large terminal panicles with bracteate, spicate branches; pedicels very short; bracts large, leafy, persistent. *Calyx-tube* short; lobes 5-6, deciduous. *Corolla* .2 in. long, funnel-shaped, pilose outside; lobes 5, short, valvate. *Stamens* 5; filaments dilated upwards; anthers linear. *Ovary* 2-celled; ovules numerous; style long-exserted, entire; stigma spindle-shaped. *Fruit* a loculicidally dehiscent capsule, .5-.7 in. long, on short recurved pedicels, ellipsoid, 2-valved, many-seeded; seeds flat, lenticular, winged all round the margin, .3 by .1 in. including the wing.

Not uncommon in the Sál forests of the Dún although rare in the WESTERN DÚN, and frequently met with in the better class of SAHÁRANPUR FORESTS; Phándowála, Lachiwála, Tháno; Mohand, etc.

Wood brownish-grey, close-grained but light and soft; heart-wood not distinct; weight about 30 lbs. per c. ft. Used for agricultural implements, palanquins, scabbards, toys and similar other articles. The bark is used for tanning and as a febrifuge, and the leaves as cattle-fodder.

Leaflets Nov.-May. Fl. June-Aug. Fr. Cold season.

6. *Wendlandia*, Bartl.

Shrubs or small trees. *Leaves* opposite or ternately whorled. *Flowers* small, white or rosy, in terminal paniced cymes, 2-3-bracteolate. *Calyx-lobes* 4-5, subequal, persistent. *Corolla* tubular or funnel-shaped; lobes 4-5, imbricate in bud. *Stamens* 4-5, between the corolla-lobes; anthers exserted. *Ovary* usually 2-celled; cells many-seeded; style slender; stigma entire or bifid. *Capsule* globose, 2-valved, many-seeded; seeds very minute, obscurely winged.

Analysis of the Species.

- | | |
|---|-------------------------|
| Stipules recurved; leaves at least three times as long as broad; lateral nerves 12-20 pairs | 1. <i>W. exserta</i> . |
| Stipules erect; leaves about twice as long as broad; lateral nerves 10-12 pairs | 2. <i>W. puberula</i> . |

1. *W. exserta*, DC.; Fl. Br. Ind. iii. 37; Brandis For. Flora 268, Ind. Trees 373; Gamble Man. Ind. Timb. 408. Vern. *Bathuá*, E. Saháranpur; *Chaulái*, W. Saharanpur.

A small deciduous tree; bark rough, brown, longitudinally cracked and exfoliating in long strips; branchlets, leaves and inflorescence grey-tomentose. *Leaves* 4-9 by 1-3.5 in., ovate, ovate-lanceolate or narrow-oblong, finely acuminate, coriaceous, sometimes glabrate above, often densely pubescent beneath; lateral

nerves 12-20 pairs, parallel; petiole .5-1 in. long; stipules intrapetiolar, ovate, acute, recurved. *Flowers* sessile, .15 in. diam., dull-white, fragrant, in cymes which again are disposed in large, very dense conical terminal panicles much exceeding the leaves. *Calyx-lobes* 4-5, ovate or subulate, persistent. *Corolla* funnel shaped; lobes imbricate in bud. *Anthers* versatile, exserted. *Ovary* 2-celled. *Capsules* .1 in. long, white-tomentose.

Very common in the SIWALIK TRACTS, especially along the passes and on land-slips; also found in the TONS VALLEY; from Kálsi to Thadiár.

Wood reddish-brown, hard and close-grained; weight 47 lbs. per c. ft. It is used for building and agricultural implements.

Fl. Mar., April. Fr. Rainy season.

2. *W. puberula*, DC., Fl. Bl. Ind. iii. 37; Brandis For. Flora 576, Ind. Trees 373; Gamble Man. Ind. Timb. 408.

A small deciduous tree with rough brownish-grey bark; innovations puberulous. *Leaves* 4-8 by 2.5-4 in., elliptic or oblong, acute, less frequently acuminate, rather membranous, glabrous above except along the nerves, with brown pubescence along the midrib and nerves beneath; lateral nerves 10-12 pairs, less prominent than in the other species; base acute; petiole .3-7 in. long; stipules .2-2 in. long, usually caudate-acuminate, erect, persistent. *Flowers* sessile, very small, bluish-white, in terminal and axillary panicles which are generally shorter than the leaves. *Calyx* hairy; lobes triangular. *Corolla* funnel-shaped; lobes shorter than the tube. *Capsules* about .1 in. long, nearly glabrous.

Fairly common along banks of streams in the TONS VALLEY, JAUNSAIR and TEHRI-GARHWAL, up to 4,000 ft.; Dhármigádh; Thadiár, Sendrá, etc. Also Sansáru Khálá, Málkot.

Fl. May, June. Fr. Dec.-Jan.

7. *Randia*, Linn.

Shrubs or trees, often spinous. *Leaves* opposite or falsely alternate; stipules intrapetiolar, short. *Flowers* white, fading to yellow, solitary fascicled or corymbose, usually axillary. *Calyx-limb* tubular; lobes long or short. *Corolla-tube* usually cylindrical, long or short; lobes usually 5, twisted in bud. *Stamens* 5; anthers subsessile, narrow. *Ovary* generally 2-celled; ovules

usually numerous on fleshy placentas; style entire or bifid. *Fruit* a succulent berry, 2-celled, generally many-seeded; seeds angular.

Analysis of the Species.

- A small shrub. Fruit .3 in. long, 4-seeded 1. *R. tetrasperma*.
 Small trees. Fruit 1-2 in. long, many-seeded.
 Spines short, at the ends of the branchlets; corolla glabrous outside 2. *R. uliginosa*.
 Spines long, axillary; corolla hairy outside 3. *R. dumetorum*.

1. *R. tetrasperma*, Benth. & Hook. f.; Fl. Br. Ind. iii. 109; Brandis For. Flora 272, Ind. Trees 381; Gamble Man. Ind. Timb. 412. Vern. *Bhedrá*, *Dinwá*, *Chhotá Ginqira*, Jaunsar.

A small shrub with stiff grey branches and branchlets. *Leaves* crowded at the ends of the branchlets, .5-2 in. long, obovate or oblanceolate, narrowed into a short petiole, glabrous; stipules small. *Flowers* sessile, .4-6 in. across, greenish-white, fragrant. *Calyx-lobes* subulate. *Corolla-tube* .3 in. long; lobes oblong. *Anthers* exserted. *Stigma* long, spindle-shaped. *Berry* globose, .3-.4 in. diam., 4-seeded,—whence the specific name.

JAUNSAR and TEHRI-GARHWAL, up to 5,000 feet; Tons Valley from Maindrol to Mautárgádh. Common at Korwá. Also OUTER HIMALAYA: Málkot.

Wood white, very hard and tough; weight 56 lbs. per c. ft.; straight branches can be made into walking-sticks.

Fl. Apr., May. Fr. Cold season.

2. *R. uliginosa*, DC.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273, Ind. Trees. 381; Gamble Man. Ind. Timb. 412. Vern. *Pindálu*, *Pindár*, *Pindorá*, *Penduá*, *Penáurá*, Hind.; *Pandará*, Saháranpur.

A rigid small tree with reddish-brown bark and quadrangular branches. *Leaves* approximate at the ends of the branchlets, 2-8 by 1-4 in., obovate or obovate-oblong from a cuneate base, shining above, often pubescent along the nerves beneath, the upper usually subtending a few .5 in. long sharp decussate weak spines. *Flowers* white, solitary, sessile or peduncled. *Calyx-tube* over 1 in.

long; lobes rounded. *Corolla* large, 1-2 in. diam., showy; limb spreading; mouth of the tube partially closed with a ring of white hairs in the sessile flowers. *Stigma* fusiform, often 2-lobed. *Fruit* ovoid, up to 2 in. long, with a thick hard pulp.

Likely to occur in swampy grass lands in the DUN; common in wet lands in LOWER SAHARANPUR as at Pathi.

Wood whitish-grey, close-grained and hard; weight 48 lbs. per c. ft. The fruit is eaten, and the leaves are browsed by deer and cattle.

New leaves April. Fl. May, June. Fr.

3. *R. dumetorum*, Lamk.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273, Ind. Trees 382; Gamble Man. Ind. Timb. 413. Vern. *Maindal*, *Mainphal*, Hind.; *Madana*, Sans.

A large deciduous shrub or small tree with grey bark, and often long and stout axillary spines. *Leaves* 1-2 in. long, obovate, obtuse or acute, narrowed into the short marginate petiole, glabrous or pubescent or rough with stiff hairs; stipules ovate, acuminate. *Flowers* greenish- or yellowish-white, fragrant, solitary or 2-3 together at the ends of short lateral branchlets, shortly pedunculate. *Calyx* strigose; tube 2-3 in. long; lobes ovate, foliaceous, as long as the tube. *Corolla-lobes* spreading, oval or oblong, .5-.75 in., covered with adpressed white hairs; tube up to the tips of the calyx-lobes. *Fruit* a soft fleshy berry, 1-1.5 in. long, globose or ovoid, yellow, glabrous or pubescent; pericarp thick, leathery; seeds compressed, imbedded in a gelatinous pulp.

Extremely common throughout the DEHRA AND SAHARANPUR DIVISIONS, and also found in the Amlāwa and Tons Valleys in JAUNSAR. Affects the shade of Sāl and other forest trees.

Wood light-brown or white, compact, hard—used for agricultural implements, walking sticks, fences and fuel. Weight 55-60 lbs. per c. ft. The leaves are lopped for fodder. The unripe fruit is used to poison fish, and is also eaten raw or roasted when ripe. The bark and the fruit are used in Indian medicine.

Fl. Apr.-June. Fr. Cold season.

8. *Gardenia*, Linn.

1. *G. turgida*, Roxb.; Fl. Br. Ind. iii. 118; Brandis For. Flora 270, Ind. Trees 380; Gamble Man. Ind. Timb. 416. Vern. *Phanclā*, Hind.

A small deciduous tree, armed with strong axillary often leaf-bearing spines; bark smooth, bluish-grey, unealy on branches.

Leaves opposite, crowded at the ends of the branches, very variable in size, 1-4 in. long, obovate or elliptic, obtuse or short-acuminate, coriaceous, tomentose beneath, pubescent or glabrous and at length shining above, sessile or narrowed into a short marginate petiole; stipules triangular, distinct, caducous. *Flowers* 1-4, about 1 in. long, fragrant, axillary or at the ends of short lateral branchlets. *Calyx* .15 in. long, sub-truncate in male flowers, with oblong foliaceous lobes in female flowers. *Corolla* white; tube 3-5 in. long, slightly dilated upwards; lobes oblong, longer than the tube. *Stamens* as many as the corolla-lobes; anthers sessile, linear, included with only the tips slightly exerted. *Ovary* 1-celled; ovules numerous, inserted in 2 series on 2-6 parietal placentas. *Fruit* 2-3 in. long, pyriform, obovoid or globose, grey-mealy outside, furrowed at the base; pericarp thick, leathery; endocarp woody; seeds numerous, compressed, immersed in pulp.

Common throughout the SAHÁRANPUR SIWALIKS, especially near Ranipur, Dholkhand and Sháhjahánpur. Also found in certain localities in the Dún, e.g., Lachiwála, Nágsidh, Timli, etc., but not quite so common.

Wood dirty-white, close-grained, fairly hard, weighing about 55 lbs. per c. ft. It splits and cracks in seasoning, and is scarcely used except for fuel. The fruit is eaten cooked in Central India, and is also used medicinally, especially in affections of the mammary glands,—whence the vernacular name.

According to certain observers if one places one's hands on the stem of this tree in the summer so as to encircle it, the leaves begin to shake.

Fl. Mar., Apr.. Fr. Cold season.

9. Pavetta, Linn.

1. *P. indica*, Linn.; Fl. Br. Ind. iii. 150; Brandis Ind. Trees 387; Gamble Man. Ind. Timb. 421. Syn.—*P. tomentosa*, Smith; Brandis For. Flora 275, Vern. *Angári*, Dún. *Papula*, Sans.

A large shrub with smooth brownish-grey bark. *Leaves* opposite, 3-9 by 1-3.5 in., elliptic, obovate or oblanceolate, obtuse acute acuminate or caudate, subcoriaceous, glabrous or tomentose; lateral nerves 10-15; petiole .5-1.5 in. long; stipules united into an intrapetiole sheath, generally persistent. *Inflorescence* a terminal or sub-lateral, dense or lax, flat-topped corymb. *Flowers* white, fragrant; bracts broad, membranous. *Calyx* about .08 in. long, shortly-toothed. *Corolla* about 1 in.; tube long, very slender; lobes 4, oblong, twisted in bud, afterwards spreading and recurved.

Stamens 4, on the mouth of the corolla-tube; filaments short. *Ovary* 2-celled; ovule solitary, attached to a prominent placenta; style *filiform*, twice as long as the corolla-tube; stigma slender, fusiform. *Berry* the size of a pea, with 2 plano-convex pyrenes; seeds peltate.

Var. *tomentosa*, Roxb., is characterised by having the inflorescence and leaves beneath pubescent or villous, and the corymbs sublateral (at the extremities of lateral, often leafless branchlets) and long peduncled.

Common in moister parts of forest in the DÚN and the SIWALIK TRACT: Tháno, Lachiwála, Mohkumpur, Rámgarh, Asárōri, etc.

Wood light-brown, hard and close-grained; weight 59 lbs. per c. ft.

Fl. Apr., May. Fr. Cold season.

10. *Coffea*, Linn.

1. *C. bengalensis*, Roxb.; Fl. Br. Ind. iii. 153; Brandis For. Flora 277, Ind. Trees 390; Gamble Man. Ind. Timb. 422.

A small deciduous shrub with slender spreading branches, and thin brownish-grey bark. *Leaves* opposite, about 5 by 3 in., ovate or elliptic, acuminate, membranous, glabrous, narrowed into a short petiole; stipules interpetiolar, broad, subulate, persistent. *Flowers* solitary or in pairs, axillary, white, fragrant, 1-1.5 in. across, appearing before or with the leaves. *Calyx-tube* short, many-toothed. *Corolla* funnel-shaped; tube .5-.7 in. long; lobes ovate-oblong, slightly shorter than the tube, spreading or recurved, twisted in bud. *Stamens* inserted in the mouth of the corolla-tube; anthers subsessile, narrow. *Ovary* 2-celled; ovules solitary, peltately attached to the dissepiment; style bifid, filiform. *Fruit* a drupe, about .5 in. long, oblong, black, with 2 plano-convex pyrenes; seeds plano-convex, with a ventral groove; albumen horny.

Fairly common in shady ravines in the DÚN, and along the foot of the OUTER HIMALAYA; Bindál-nálá, Lachiwála, Rámgarh, Tháno, Nálápáni, Robbers' Cave, Mothronwála, etc.

The seeds are used as coffee in the Eastern Duárs of Bengal

Fl. Mar., Apr. Fr. June, July.

11. *Pæderia*, Linn.

P. foetida, Linn.; Fl. Br. Ind. iii. 195; Brandis Ind. Trees 391; Gamble Man. Ind. Timb. 425. Vern. *Gundali*. Hind: *Prasarni*, Sans.

A slender wiry nearly glabrous climber, foetid when bruised. *Leaves* opposite, 2-6 in. long by 1-2.5 in. broad, ovate or ovate-lanceolate, acuminate, entire, usually rounded or subcordate at the base, rarely acute; *petiole* .5-2 in. long. *Stipules* intrapetiolar, deciduous. *Flowers* in axillary and terminal 2-3-chotomously branched paniced cymes, 2-6 in. long, puberulous; branches long, in distant pairs; *bracts* often foliaceous. *Calyx* .15 in. long; tube campanulate, 4-5 toothed, persistent. *Corolla* .5-.65 in. long., dingy purple, tubular-funnel-shaped, tomentose; *lobes* 4-5, valvate in bud; *anthers* 4-5, subsessile, included. *Ovary* 2-celled, *ovule* 1 in each cell, basal, erect. *Stigmas* 2, capillary, twisted. *Fruit* elliptic-ovate or oblong, polished, .25-.35 in. long, blackish in colour, with a broad pale wing.

Dehra Dun, Bindal Nala; Gola Tapar; Mothronwala, etc.

Fl. May-Oct.

The leaves and root are used in medicine both internally and externally.

12. *Hamiltonia*, Roxb.

1. *H. suaveolens*, Roxb.; Fl. Br. Ind. iii. 197; Brandis For. Flora 278, Ind. Trees 390; Gamble Man. Ind. Timb. 425-Vern. *Páderá*, Málköt; *Páderá*, Jaunsar.

A small shrub with divaricate branches. *Leaves* opposite, 6-9 by 2-4 in., elliptic oblong or ovate, acute or acuminate, glabrous or pubescent, coriaceous, tough; main lateral nerves 10-15 pairs, arcuate, very prominent beneath; base acute; *petiole* .5-1 in.; *stipules* intrapetiolar, short, acute, persistent. *Flowers* sessile or shortly pedicelled, bluish-purple, sweet-scented but give an unpleasant smell when bruised, club-shaped in bud, fascicled in large lax trichotomous panicles; fascicles subumbellate; *bracts* subulate. *Calyx-segments* 4-5, longer than the ovary, persistent. *Corolla-tube* .5 in. long, trumpet-shaped, pubescent; lobes valvate. *Stamens* and *style* more or less exserted according to sex. *Capsules* ellipsoid, .1-1.5 in. long, 1-celled, 5-seeded; seeds triquetrous.

OUTER HIMALAYA, the DÚN and SIWALIKS, also low hot valleys in JAUN SAR; fairly common; a prevalent gregarious weed about Paléd, Málköt and such other places.

The wood is used for making gun-powder charcoal in Chamba.

Fl. Oct.-Jan.

13. *Leptodermis*, Wall.

1. *L. lanceolata*, Wall.; Fl. Br. Ind. iii. 198; Brandis For. Flora 279, Ind. Trees 391; Gamble Man. Ind. Timb. 426. Vern. *Páderá*, Jaunsar; *Páderá* or *Jogíá Páderá*, Garhwal and Kumaon;

A small shrub, generally gregarious on rocks; bark thin, grey. *Leaves* opposite or whorled, very variable, .5-4 by .15-1.5 in.; ovate, elliptic or elliptic-lanceolate, fetid when bruised; petiole .1-3 in. long. *Flowers* .5-7 in. long, white but fading to pale-yellow, 4-6-merous, in bracteate heads which are disposed in large terminal panicles; bracteoles cuspidate, connate to form an involucre. *Calyx-tube* obconic; lobes 5, valvate, persistent. *Corolla* funnel-shaped, hairy within; lobes 5, valvate. *Stamens* 5, exserted in the male flowers. *Ovary* 5-celled; ovule 1 in each cell; style filiform, with 5 linear arms, exserted in the female flowers. *Capsules* 5-valved, each valve terminating in a persistent ciliate calyx-tooth; seeds with a membranous testa.

OUTER HIMALAYA and JAUNSAIR 3,-9,000 ft.; Sahansradhárá, Mussoorie; Konáin, etc. Wood hard, close-grained, white.

Fl. July-Sept. Fr. Nov.-Jan.

The following plants of this Family deserve mention:—

1. *Rubia cordifolia*, Linn.; Fl. Br. Ind. iii. 202.—A perennial climbing herb with scabrid branches and whorled leaves—is common in hedges in the Dun ascending to 8,000 ft. in the hills. A valuable dye (*manjít*) is extracted from the roots and stems of this plant.

2. *Hamelia patens*, Jacq.—A large evergreen shrub with reddish-yellow flowers and leaves in whorls of 3-4—is often found in cultivation in gardens. It is a native of Tropical America.

3. *Mussaenda frondosa*, L.—A somewhat straggling shrub commonly grown in gardens as an ornamental plant. It is very conspicuous when in flower on account of one of the Calyx-lobes of each flower developing into a white membranous leaf.

4. *Gardenia florida*, Linn.—An evergreen shrub with shining glabrous leaves and white fragrant flowers which are solitary and terminal and usually double—much cultivated in gardens. It is indigenous to China.

Order 2.—ASTERALES.

XLVII. COMPOSITÆ.

Herbs or shrubs, rarely trees. *Leaves* exstipulate, alternate or opposite, simple or compound. *Inflor-*

esence a bracteate head. *Flowers* numerous, small, sessile, all tubular, or the outer or all ligulate; all bisexual, or the inner male and the outer female or neuter, sometimes dioecious. *Calyx* superior; limb none, or of hairs or scales. *Corolla* either tubular or campanulate with 4-5 valvate lobes, or ligulate with strap-shaped elongated connate lobes. *Disk* epigynous. *Stamens* 4-5, usually syngenesious, anthers basifixed; connective produced. *Ovary* inferior, 1-celled; ovule solitary, erect; style slender, 2-fid, arms linear, often hairy. *Fruit* a cypsela usually crowned with the hairy calyx (pappus); seed exalbuminous; testa membranous

With very few exceptions, all the species in this largest of all Families are herbaceous, *Leucomeris*, described below, being the only tree Genus found within our limits. The following key applies only to the species of the genera described in the Flora.

Analysis of the Genera.

Heads homogamous, 2-sexual.

Flowers all tubular, never yellow.

Heads 1-flowered, crowded in involu-
crate, globose clusters; leaves
spinous

ECHINOSES.

Heads few-many-flowered, leaves not
spinous.

Leaves serrate; anthers cleft at
the base; pappus of hairs with
an outer row of short bristles;
shrubby herbs

1. VERNONIA.

Leaves crenate; anthers subentire
at the base; pappus of 5 scales;
annual herbs

AGERATUM.

Leaves entire, anther-cells tailed
at the base; pappus of rigid
hairs; a tree

5. LEUCOMERIS.

Flowers all ligulate, yellow

6. CATAMIXIS.

Heads heterogamous.**Heads disciform.**

Heads many-flowered; anther-cells
tailed 2. *BLUMEA*.

Heads few-flowered; anther-cells not
tailed 4. *ARTEMISIA*.

Heads rayed.

Receptacle paleaceous; outer invol.
bracts 5, glandular *SIEGESBECKIA*.

Receptacle naked.

Flowers yellow; heads usually
numerous 3. *INULA*.

Flowers white; heads solitary,
long peduncled; leaves all radical *GERBERA*.

Note.—*Inula Cappa* has sometimes disciform heads.

1. ***Vernonia***, Schreb.

Herbs, shrubs or small trees, sometimes climbing. *Leaves* alternate. *Heads* terminal or axillary, solitary, cymose or paniced, homogamous. *Flowers* purple. *Involucral bracts* many-seriate, inner longest. *Receptacle* naked or pitted, sometimes shortly hairy. *Corolla* slender, tubular; lobes 5, narrow. *Anther-bases* obtuse. *Style* arms subulate. *Achenes* striate ribbed or angled, rarely terete. *Pappus* of many hairs, often with a row of outer shorter hairs, bristles or scales.

Analysis of the Species.

Heads clustered at the ends of short
axillary branches; invol bracts aris-
tate, the inner linear, longer than the
outer

1. *V. Roxburghii*.

Heads solitary at the ends of short axil-
lary branches, invol bracts all linear,
the inner with broad purplish tips and
shorter than the outer

2. *V. anthelmintica*.

1. ***V. Roxburghii***, Less.; Fl. Br. Ind. iii. 232, Brandis Ind.
treea. 399.

An erect rigid perennial herb or undershrub. *Leaves* subsessile, 4-5 in. long by 1-2.5-2.5 in. broad, elliptic or obovate-lanceolate, acuminate, cuspidate-serrate, subcoriaceous, rough on both surfaces. *Heads* many, .5-.75 in. diameter, fascicled at the ends of short axillary branches in terminal corymbose panicles. *Outer involucrel bracts* shorter, sometimes lanceolate, aristate, the inner longer than the outer, linear, obtuse or apiculate, all more or less woolly outside and red at the tips. *Achenes* .12 in. long, silky between the ribs. *Pappus* dirty-white or reddish.

Common in blanks and grasslands near Lachiwala and elsewhere in the Dun.

Fl. Cold season.

2. *V. anthelmintica*, Willd.; Fl. Br. Ind. iii. 236; Vern. *Kali Ziri*. Hin. ; *Nomara*j, Sans.

A coarse robust herb, 4-6 ft. high; stems striate, often blotched with purple. *Leaves* 3-6 in. long, by 1-2 in. broad, lanceolate or ovate-lanceolate, long pointed, narrowed into a short stalk, coarsely serrate, membranous, rather rough. *Heads* .5-.75 in. diameter, many-flowered, on stout peduncles .5-2 in. long, often subcorymbose. *Involucrel bracts* linear, tips dilated, coloured, outer ones longer than the inner. *Achenes* .2 in. long, narrowed towards the base, black, ribbed and hairy. *Pappus* reddish with an outer row of short rigid persistent chaffy scales.

Common in the Dun: Lachiwala near houses, etc.

Fl. Cold season.

The seeds are used as a remedy in skin diseases and in the form of a powder to drive away fleas.

2. *Blumea*, DC.

1. *B. aromatica*, DC., Fl. Br. Ind. iii. 270; Brandis Ind Trees 401.

A glandular aromatic shrub-like herb 4-10 ft. high. *Leaves* alternate, 6-12 in. long, by 1.5-4 in. broad, obovate-oblong, acute, serrate or coarsely toothed or lobulate, membranous, more or less glabrous above, viscid-pubescent beneath, narrowed into a short petiole or the upper sessile. *Heads* heterogamous, disciform, .3-.5 in. diameter in large terminal panicles much longer than the leaves. *Involucrel bracts* many-seriate, gland-puberulous, narrow, acute, the outer broader at the base and much shorter than the inner.

Receptacle glabrous. *Flowers* yellow. *Anthers* sagittate, tails small, slender. *Achenes* 10-ribbed, hairy. *Pappus* 1-seriate, slender, reddish.

Mussoorie : Rajpore ; Sahansradhara near borders of fields
Fl. Mar.-May.

3. *Inula*, Linn.

Herbs or shrubs. *Leaves* alternate. *Heads* heterogamous, rayed, rarely disciform. *Ray flowers* female, 1-many-seriate, fertile : *ligules* long, short or minute, yellow or white, 2-4-toothed. *Disk-flowers* 2-sexual, tubular, fertile, yellow : limb 5-toothed. *Involucral bracts* many-seriate, outer herbaceous, or sometimes foliaceous, inner scarious. *Receptacle* flat or tumid, pitted or areolate. *Anther-bases* sagittate, tails slender or branched. *Style-arms* of 2-sexual flowers linear, broader upwards, obtuse. *Achenes* subterete, ribbed. *Pappus-hairs* 1-2-seriate, few or many.

Analysis of the Species.

Heads disciform 1. *I. Cappa*.

Heads rayed.

Branches and leaves beneath silky-tomentose ; heads about .35 in. diam., ligules broad, short

2. *I. cuspidata*.

Branches and leaves glabrous, heads .7 in. diam.

3. *I. rubricaulis*.

1. *I. Cappa*, DC. : Fl. Br. Ind. iii. 295, Gamble Man. Ind. Timb. 427 ; Brandis Ind. Trees 400.

An erect shrub 4-8 ft. high ; branches, leaves beneath and inflorescence silky-tomentose. *Leaves* 3-6 in. long by .7-1.5 in. broad, oblong-lanceolate, narrowed at both ends, thick, shortly distantly toothed, more or less hairy above, softly silky tomentose beneath ; *petiole* 0.4 in. long. *Heads* very many, .3 in. diameter, yellow, corymbose, disciform or rarely with few and very short ligules. *Involucral-bracts* narrowly linear or subulate, rigid, pubescent, the inner ones as long as the flowers, the outer gradually

shorter. *Achenes* .06 in. long, silky; *pappus* .2 in. long, dirty-white, hairs thickened at the ends.

Common in the Outer Himalaya in Sál forests.

Fl. Sept., Oct.

2. *I. cuspidata*, Clarke.; Fl. Br. Ind. iii. 296; Gamble Man. Ind. Timb. 427; Brandis Ind. Trees. 401.

An erect shrub 4-8 ft. high; branches slender, usually silky tomentose. *Leaves* 3-5 in. long by 1-2 in. broad, elliptic-lanceolate, serrulate, acuminate, thin membranous, pubescent when young, nearly glabrous when mature or rough above, thinly pubescent beneath; *petiole* .2-5 in. long, slender. *Heads* numerous, rayed, about .35 in. diameter, in terminal corymbs. *Involucral-bracts* linear, rigid, acute, inner ones as long as the flowers, outer shorter, pubescent; *ligules* short broad. *Achenes* silky, .06 in. long; *pappus* .2 in. long, yellowish-white, hairs thickened at the tips.

JAUNSAR and OUTER HIMALAYA, up to 6,000 ft.

Fl. Sept.-Oct.

3. *I. rubricaulis*, Clarke; Fl. Br. Ind. iii. 296.

A shrub up to 6 ft. high; branches long, slender, flexuous, glabrous, reddish in colour. *Leaves* sessile, 3-6 in. long by 1-1.5 in. broad, elliptic-lanceolate, acuminate, serrate, membranous, pilose when young, ultimately glabrous. *Heads* .7 in. diameter, rayed, 3-5 together in very short axillary corymbose racemes, the peduncles and pedicels slender, pilose. *Involucral-bracts* subulate-lanceolate, acuminate or aristate, green or purplish, pilose. *Ligules* yellow, conspicuous. *Achenes* .12 in. long, silky; *pappus* .25 in. long, white, hairs not thickened at the tips.

Mussoorie; Arnigadh.

Fl. Mar.-April.

4. *Artemisia*, Linn.

A. vulgaris, Linn.; Fl. Br. Ind. iii. 328; Brandis Ind. Trees 402.

An aromatic shrub 4-8 ft. high, often gregarious, pubescent or tomentose. *Leaves* alternate, lower 2-4 in. long by 1-2 in. broad, petioled, ovate in outline, with stipule-like lobes at the base, 1-2-pinnatisect, finely pubescent above, ashy-grey or white-tomentose beneath, upper leaves often sessile, linear lanceolate, entire or 3-fid.

Heads heterogamous 12-16 in. long, in spicate paniced racemes ; outer flowers female, slender, inner 2-sexual, all fertile and brownish-yellow. *Involucral-bracts* few-seriate, villous, with scarious margins, the outer shorter, herbaceous, the inner longer, scarious. *Achenes* minute ; *pappus* 0.

A common weed in gardens and camping grounds in the Dun and sunny slopes in the Hills.

Fl. Aug.-Oct.

5. *Leucomeris*, Don.

L. spectabilis, Don : Fl. Br. Ind. iii. 386 ; Brandis Ind. Trees 400 ; Gamble Man. Ind. Timb. 428. Vern. *Phusiari*, *Phusára*. Hind.

A large shrub or small tree with white corky bark ; branches stout, grooved. *Leaves* alternate, 4-14 by 1-5-4 in., narrow-oblong or oblanceolate, entire or minutely cuspidate-serrate, coriaceous, glabrous above, thickly white-felted beneath, narrowed into a marginate petiole 5-1 in. long ; lateral nerves about 16 pairs. *Heads* 7-1 in. long, in globose thickly white-tomentose bracteolate corymbs. *Flowers* 4-8 in each head, all similar and fertile, about 1 in. long ; bracts in many series. *Involucre* much shorter than the flowers. *Corolla* 5 in. long, tubular ; segments narrow. *Style* 2-fid. *Cypselæ* about 2 in. long, 5-ribbed, slender, densely silky ; *pappus* 5 in. long, rather rigid.

Fairly common in the OUTER HIMALAYA from Sâia to Hrishikesh, 3,600 ft. Occasionally in the DUN, e.g., at Bulâwâla and Kâlûwâla.

The wood is brownish-white, fairly compact and even-grained, but the tree is generally hollow in the centre, rendering the wood useless.

Fl. Cold season. Fr. Apr., May

6. *Catamixis*, Thoms.

C. baccharioides, T. Thoms. ; Fl. Br. Ind. iii. 389.

An undershrub 3-5 ft. high, branches silky tomentose. *Leaves* alternate, 2-3 in. long by 1-1-5 in. broad, obovate or obovate-spatulate, distantly crenate or crenate-serrate above the middle, coriaceous, glabrous, base narrowed into a short semi-amplexicaul petiole. *Heads* 3 in. long, homogamous, 2-sexual, in many-flowered, terminal corymbs. *Flowers* all ligulate, yellow. *In-*

volucral-bracts few, many-seriate, lanceolate, acuminate, the outer smaller. *Achenes* turbinate, silky-villous; *pappus* .3 in. long, white.

Sandy cliffs in the Siwalik Tract, e.g., Timh Pass; Beribara; etc.

Fl. Dec.-Jan.

The following plants of this Family also deserve mention:—

1. *Ageratum conyzoides*, Linn., Fl. Br. Ind. iii. 243. A softly hairy annual weed 1-2 ft. high. *Leaves* opposite or the upper alternate, 2-3 in. long by 1-2 in. broad, ovate, subacute, crenate, cuneate to subcordate at the base, more or less hairy on both surfaces; *petiole* 1-1.25 in. *Heads* discoid, .25 in. diameter, in dense terminal corymbs. *Flowers* pale-blue, all tubular. *Involucral-bracts* linear, acute, ribbed on the back, ciliolate and with scarious margins. *Pappus* of 5 scales, connate below, aristate and minutely serrulate.—Abundant within the area, usually in damp places. It is a troublesome weed.

Fl. Nov.-Mar.

2. *Siegesbeckia orientalis*, Linn.; Fl. Br. Ind. iii. 204; Duthie Fl. Up. Gang. Pl. 467. Vern. *Lichkurá*, Garhwal. A large erect annual up to 6 or 7 ft. in height, common on damp fallow lands and coppice areas throughout the DŪN and the HILLS up to 5,000 ft., conspicuous by the large spreading linear-spathulate outer involucre bracts which by means of their viscous glandular hairs catch on to clothes. *Leaves* opposite, 2-5 by 1-3.5 in., gradually smaller upwards, triangular-ovate, irregularly toothed, velvety-pubescent, gradually narrowing into a winged petiole. *Heads* small, peduncled, one at each node of the branches or branchlets. *Flowers* usually yellow. *Cypsela* curved, quadrangular, black, each enclosed in an inner bract. The leaves, which are very bitter, are used by the hill-people as a febrifuge, each being pounded and kneaded into a pill to be taken with a little water. Fl. Oct.-Dec.

3. *Echinops echinatus*, DC.; Fl. Br. Ind. iii. 358. Vern. *Gokhru*, Hind. A thistle-like herb with white felt, common in fallow lands in the DŪN. *Leaves* alternate, pinnatifid, spinous, thickly white-felted beneath. *Heads* 1-flowered, crowded in a globose white ball 2-3 in. across. *Cypsela* oboconic, silky.

4. *Gerbera lanuginosa*, Benth.; Fl. Br. Ind. iii. 390. Vern. *Kupheru*, Jaunsar; *Jhulá*, *Jhulu*, *Kapás*, Garh.—JAUNSAAR and TEHRI-GARHWAL up to 8,000 ft., also in shady places along the crest of the SIWALIKS, almost always on cliffs. A scape-bearing

small herb with lyrate pinnatifid or lobed radical leaves thickly felted below. *Scape* 4-12 in. long, cottony. *Heads* 1-1.5 in. across, hemispherical. *Cypsela* ribbed. The cotton obtained from the leaves is used by the JAUNSAIS as tinder for their *chuckmuck*, and occasionally made into coarse cloth or bags.

5. *Tithonia diversifolia*, Gray.—A large shrub 7-8 ft. high with alternate 3-5-lobed leaves, 4-6 in. long, pubescent on both surfaces. *Flower-heads* solitary, axillary and terminal, rayed, about 4 in. diameter, yellowish-orange in colour. *Achenes* quadrangular. *Pappus* of scales with 1 or 2 bristles. It is a native of Mexico and Central America, but has now become naturalised in the Dun. Fl. Cold season.

Series ii.—*Hypogynæ*.

Order 3.—*ERICALES*.

XLVIII. ERICACEÆ.

Shrubs or trees, rarely herbs. *Leaves* usually alternate, simple, exstipulate. *Flowers* solitary, fascicled or racemed, usually regular, sometimes dimorphous. *Calyx* usually free; lobes 5, rarely 4 or 6. *Corolla* hypogynous, campanulate or urceolate. *Stamens* generally twice as many as the corolla-lobes, hypogynous or epipetalous; filaments free; anthers 2-celled, opening at the top by pores or slits, rarely longitudinally. *Ovary* superior, 4-5-many-celled; ovules many in the inner angles of the cells; style cylindrical; stigma entire or obscurely lobed. *Fruit* a 5-valved capsule; seeds very small, albuminous.

Analysis of the Genera.

- | | |
|---|--------------------------|
| Flowers in racemes; capsules globose,
loculicidally dehiscent | 1. <i>PIERIS</i> . |
| Flowers fascicled or subcorymbose; cap-
sules elongate, septicidally dehiscent | 2. <i>RHODODENDRON</i> . |

1. **Pieris**, D. Don.

1. **P. ovalifolia**, D. Don ; Fl. Br. Ind. iii. 460 ; Gamble Man. Ind. Timb. 431 ; Brandis Ind. Trees 409. Syn. *Andromeda ovalifolia* Wall. ; Brandis For. Flora 280. Vern. *Āyār*, *Anyār*, Jaunsar.

A small deciduous tree ; bark brown, peeling off in narrow strips, often deeply furrowed with spiral clefts. *Leaves* 3-6 in. long, ovate or elliptic-oblong, acute or acuminate, entire, rounded at the base, coriaceous, glabrous, often pilose beneath when young ; petiole .2-.5 in. *Inflorescence* a simple raceme, rarely falsely panicle ; bracts lanceolate or linear, deciduous. *Flowers* white. *Calyx-lobes* 5, triangular-lanceolate, .1-.12 in., connate at the base. *Corolla* .2-.4 in. long, elongate-ovoid, pubescent without ; lobes 5, short, recurved. *Stamens* 10, hypogynous, filaments subulate, ciliate, with two filiform appendages at the apex ; anthers open by terminal pores. *Ovary* 5-celled, ovules many in each cell. *Capsules* .2 in. diam., globose, loculicidally 5-valved ; seeds many, minute, linear-oblong.

Common in JAUN SAR, between 4,000 and 8,000 ft., always associated with *Quercus incana* and *Rhododendron arboreum*.

Wood light, reddish-brown, moderately compact and hard, but not durable and warps and shrinks badly in seasoning ; weight 41 lbs. per c. ft. It is used only for fuel and charcoal, but even as fuel it is not considered good, as it does not burn well but only smoulders. The leaves are poisonous to goats and camels ; they are used to kill insects, and an infusion of them is applied in skin diseases of parasitic origin.

Fl. Apr.-June according to elevation. Fr. July-Sept.

2. **Rhododendron**, Linn.

Trees or shrubs. *Leaves* alternate or falsely whorled, often clustered at the ends of the branches, entire, coriaceous, edges often slightly recurved. *Flowers* usually in compact terminal clusters or in umbelliform corymbs, rarely solitary ; buds enclosed in scaly bracts. *Calyx* 5-lobed, sometimes obsolete. *Corolla* campanulate or funnel-shaped ; lobes 5-10. *Stamens* usually 10, rarely 5 or 20 ; anthers dehiscing by terminal pores. *Ovary* 5-20-celled ; ovules many in each cell. *Capsules*

septicidally 4-20-valved from the apex; seeds very numerous, scale-like, albuminous.

Analysis of the Species.

- Trees or large shrubs; calyx small or obsolete (flowers in terminal corymbs).
 Leaves silvery- or rusty-tomentose beneath; pedicels 0 or very short; ovary woolly 1. *R. arboreum*.
 Leaves cinnamonous-tomentose beneath; pedicels long; ovary glabrate 2. *R. campanulatum*.
 Small shrubs; calyx prominently lobed; lobes long, foliaceous.
 Flowers solitary or 2-3 together; peduncles long, scabrous; leaves subsessile 3. *R. lepidotum*.
 Flowers in terminal corymbs; pedicels short, glabrous; leaves petiolate 4. *R. Anthopogon*.

1. *R. arboreum*, Sm.; Fl. Br. Ind. iii. 465; Brandis For. Flora 281, Ind. Trees 409; Gamble Man. Ind. Timb. 433. The Tree-Rhododendron. Vern. *Burins*, Jaunsar.

A small evergreen tree; bark reddish-brown, peeling off in small flakes. *Leaves* crowded at the ends of the branches, 4-6 in. long, lanceolate or elliptic-oblong, acute at both ends, coriaceous, glabrous above, rusty-tomentose or covered with small silvery scales beneath; nerves and midrib prominent beneath, depressed above; buds viscous. *Flowers* large, very showy, commonly deep-crimson, rarely pink or nearly white, in corymbose fascicles at the ends of the branches; pedicels 0 to one-third the length of the corolla-tube; bracts hairy. *Calyx-lobes* .1 in. wide, ovate, or very obscure. *Corolla* campanulate, 1-1.5 by .8-1 in.; lobes 5, often unequal. *Stamens* 10, alternately longer. *Ovary* woolly, 7-9-celled. *Capsules* 1 in. long, cylindrical, curved, longitudinally ribbed; seeds ellipsoid.

Common in JAUN SAR and TEHRI-GARHWAL, between 4,000 and 8,000 ft., almost always associated with *Pieris ovalifolia* and *Quercus incana*.

Wood soft, brownish or reddish-white, close- and even-grained, seasons badly, and is apt to warp and shrink; weight 40-45 lbs. per c. ft. It is chiefly used for fuel and charcoa, but is

sometimes locally used for building, for making dishes, gun-stocks, tool-handles, etc. The flowers which are sour to the taste are eaten and are made into preserves. They are believed to be good for dysentery and are applied as a poultice in headaches, also offered in temples in the hills. The viscid tender leaves are eaten cooked as a vegetable.

Fl. Usually Mar.-May. Fr. Autumn and cold season.

2. **R. campanulatum**, Don. : Fl. Br. Ind. iii. 466 ; Brandis. For. Flora 281, Ind. Trees 410 ; Gamble Man. Ind. Timb. 434. Vern. *Simris*, T.-Garhwal.

A moderate-sized evergreen shrub with thin grey bark. *Leaves* 3-5 in. long, elliptic or elliptic-oblong, rounded at both ends, crowded at the ends of the branches, mucronate, coriaceous, glabrous and finely reticulate above, with a dense cinnamon-colour tomentum concealing the nerves beneath ; midrib prominent. *Flowers* large and showy ; whitish-pink purple or lilac, in lax terminal corymbs ; pedicels as long as the corolla-tube ; bracts silky. *Calyx-teeth* broadly triangular, very small. *Corolla* campanulate, 1-1.5 by .8-1 in. ; lobes 5. *Stamens* 10. *Ovary* 5-9-celled, glabrous ; style persistent. *Capsules* cylindrical, about 1 in. long, more or less curved ; seeds linear-oblong compressed.

TEHRI-GARHWAL, above 10,000 ft. ; Rikhsin, Kedār Kántá Chánsil, etc.

Wood light pinkish-red, close-grained and moderately hard ; weight about 40 lbs. per c. ft. "The leaves are brought to the plains and used as snuff."—*Sir D. Brandis*.

Fl. May-July. Fr. Oct.-Dec.

3. **R. lepidotum**, Wall. : Fl. Br. Ind. iii. 471 ; Brandis For. Flora 282, Ind. Trees 412 ; Gamble Man. Ind. Timb. 432. Vern. *Simris*, T.-Garhwal.

A small aromatic shrub ; young parts covered with glandular scales. *Leaves* .7-1 in. long, approximate at the ends of the branches, sessile or subsessile, obovate and obtuse, or lanceolate and subacute, glabrous above, silvery- or brown-tomentose beneath. *Flowers* red, yellow or purple, solitary or 2-3 together ; pedicels .5-1.5 in. long, very scabrous. *Calyx-lobes* oval, not ciliate. *Corolla-tube* short ; lobes round, spreading, .2-.3 in. long. *Stamens* usually 8. *Ovary* 5-celled. *Capsules* 5-celled, .3 by .2 in. ; seeds oblong, acute.

TEHRI-GARHWAL, 9, 11,000 ft., usually on rocks : Chánsil, Gangottari, etc.

“The leaves of this and the preceding species are used as stimulants in native medicine” (*Sir D. Brandis*) under the name *Talispatra* or *Talispal*.

Fl. June, July.

4. **R. Anthopogon**, Don; Fl. Br. Ind. iii. 472; Brandis For. Flora 282, Ind. Trees 412; Gamble Man. Ind. Timb. 432. Vern. *Tális*, *Tálisri*, Punjab Hills.

A small shrub with an aromatic odour; branchlets scabrous and scaly. *Leaves* 1-1.5 in. long, elliptic or broad-oblong, shining above, brown-tomentose beneath; petiole .12-.25 in. long. *Flowers* yellow, in dense terminal corymbs. *Calyx-lobes* oblong or elliptic, membranous, ciliate. *Corolla* tubular with a dilated mouth; tube .2 in. long; lobes obovate, entire, spreading. *Stamens* 6-8. *Ovary* scaly. *Capsules* .2 in. long, ovoid; seeds oblong, subacute.

TEHRI-GARHWAL, above 11,000 ft.: Kedār Kánta, Harkī Dún, etc. Also the Chur Mountain, JEEBAL. Gregarious and generally under the equally gregarious *Betula utilis*.

Fl. June, July.

Order 4.—PRIMULALES.

XLIX PLUMBAGINACEÆ.

Herbs or under-shrubs. *Leaves* radical, rosulate or cauline and alternate; *stipules* 0. *Flowers* 2-sexual, regular; *bracts* usually scarious, sheathing the flowers; *Calyx* inferior, tubular, 5-10 ribbed, mouth frequently funnel-shaped. *Petals* 5, 5-lobed, scarious, free or connate at the base, rarely united into a linear tube, spreading. *Stamens* 5, opposite the petals; *filaments* nearly free or adnate below to the corolla. *Ovary* superior, 1-celled; *styles* 5, distinct or more or less connate; *ovule* anatropous, pendulous from a basal funicle. *Fruit* capsular, included within the calyx. *Seeds* cylindric, pendulous.

Plumbago, Linn.**P. zeylanica**, Linn. ; Fl. Br. Ind. iii. 480. Vern. *Chitrak*

A diffuse rambling undershrub ; twigs striate, green. *Leaves* alternate, 1·5-3 in. long by ·75-2 in. broad, thin, ovate, entire, acute, glabrous, somewhat glaucous beneath, base abruptly narrowed, *petiole* ·25-5 in. long, margined above, base dilated and amplexicaul. *Flowers* white, in terminal bracteate, often branched glandular spikes ; *bracts* ovate, acuminate, shorter than the calyx, glandular or not. *Calyx* ·4-·5 in. long, tubular, glandular, 5-ribbed, 5-toothed, persistent. *Corolla* salver-shaped ; tube ·7-9 in. long, slender, lobes 5, obovate-oblong, apiculate ; *stamens* 5, opposite the corolla lobes ; *filaments* as long as the corolla-tube. *Capsule* oblong pointed, circumsiss near the base and splitting upwards into 5 valves, as long as the persistent calyx.

DEHRA DUN in open scrub forest, ascending to 4,000 ft. in the hills, e.g., Birpur ; Kalsi, etc.

Fl. Apr.-Sept.

The root is used in medicine in the treatment of dyspepsia and certain skin diseases.

P. capensis, Thumb.—A small subscandent shrub with subverticillate oblong or oblong-spathulate leaves about 2 in. long and pale blue flowers which are produced in great profusion in the hot and rainy seasons. It is indigenous to Cape of Good Hope and is cultivated in gardens as an ornamental plant.

L. MYRSINACEÆ.

Shrubs or small trees. *Leaves* alternate, simple, exstipulate, generally gland-dotted. *Flowers* small, regular, in axillary clusters, racemes or panicles, rarely terminal. *Calyx* free, exceptionally adhering to the ovary ; lobes persistent, sometimes accrescent in fruit. *Corolla* regular ; petals connate or free, contorted or imbricate. *Stamens* epipetalous, as many as the petals or corolla-lobes and opposite to them ; anthers oblong, free or united by their margins. *Ovary* 1-celled ; *ovules*

few or many, inserted on a free-central placenta ; style filiform or columnar. *Fruit* a berry, often coloured ; seeds excavate at the base.

Analysis of the Genera.

- Calyx adnate to the ovary ; fruit many-seeded 1. *MÆSA*.
 Calyx free ; fruit 1-seeded.
 Petals free ; flowers racemed or paniced 3. *EMBELIA*.
 Petals united into a short tube.
 Fls. in dense axillary clusters ; corolla imbricate 2. *MYRSINE*.
 Fls. in umbels, acemes or corymbs ; corolla twisted to the right 4. *ARDISIA*.

1. *Mæsa*, Forsk.

1. *M. indica*, Wall. : Fl. Br. Ind. iii. 509 ; Brandis For. Flora 283, Ind. Trees 414 ; Gamble Man. Ind. Timb. 438.

A large shrub with long straggling branches. *Leaves* 3-5 by 1-1.5 in., lanceolate or elliptic-oblong, distantly sharp-toothed, subcoriaceous or membranous ; primary nerves 5-9 pairs ; petiole about .5 in. *Flowers* white, small, in compound racemes much longer than the petiole ; bracts minute. *Calyx-tube* more or less adnate to the ovary ; lobes 5, obtuse, pubescent, persistent. *Corolla* gamopetalous, white, 5-lobed, twice the size of the calyx. *Stamens* 5 ; filaments short ; anthers broad. *Fruit* a globose berry, about .15 in. across, crowned with the persistent calyx-lobes and often tipped by the remains of the style, fleshy juicy and pinkish-white when ripe.

Common in the SUB-HIMALAYAN HILLS : Paléd, Sansarú Khálá, Mussoorie, etc.

The berries are eaten in Nepal, and the leaves are used to poison fish in Canara.

Fl. Dec.-Apr. and sometimes also in the rains. Fr. Cold season.

M. argentea, Wall. : Fl. Br. Ind. iii. 510 ; Brandis Ind. Trees 415,—has been collected near Mussoorie. It is a shrub 4-8 ft. high with softly pubescent branchlets and elliptic or ovate, acuminate leaves 6-10 in. long, thin, pubescent and sometimes whitish beneath ;

petiole .5-1 in. long; *flowers* in short, compact, pubescent, axillary racemes about as long as the petiole. *Berry* .15-.2 in. diameter, globose, pinkish or nearly white.

2. *Myrsine*, Linn.

Shrubs or small trees. *Leaves* entire or serrate punctate, usually coriaceous. *Flowers* polygamous or dioecious, fascicled usually at the axils of fallen leaves; bracts densely imbricate. *Calyx* 4-5-lobed, persistent. *Corolla* 4-5-partite; segments imbricate, recurved. *Stamens* 4-5. *Ovary* superior, globose; ovules many; style short, cylindrical. *Fruit* 1-seeded, small, globose berry, red or purple when ripe; seed excavate.

Analysis of the Species.

A small shrub with pubescent branchlets.

Leaves small, subsessile 1. *M. africana*.

A small glabrous tree. Leaves usually

large, petiolate 2. *M. semiserrata*.

1. *M. africana*, Linn.; Fl. Br. Ind. iii. 511; Brandis For. Flora 286, Ind. Trees 416; Gamble Man. Ind. Timb. 438. Vern. *Banwán*, Jaunsar; *Rikhdálmí*, Garhwal.

A small evergreen shrub; branchlets and petioles ferruginous-pubescent. *Leaves* .5-1.5 by .3-.5 in., lanceolate or obovate, sharply cuspidate-serrate; midrib prominent; petiole minute. *Flowers* small, subsessile, tetrandrous, in axillary fascicles of 4-6. *Anthers* exceeding the corolla. *Style* short; stigma flat. *Berry* usually solitary, red, smooth, .1 in. diam., swelling to .25 in. diam. and dark-purple or black when fully ripe.

Common in JAUNSAK and in the OUTER HIMALAYA, 3,-9,000 ft.

The fruit is used in Indian medicine as an anthelmintic under the name of *Bebrang* or *Baibrán*.

Fl. Mar. May. Fr. Apr.-May to Nov.-Dec.

2. *M. semiserrata*, Wall.; Fl. Br. Ind. iii. 511, Brandis For. Flora 285, Ind. Trees 416; Gamble Man. Ind. Timb. 439. Vern. *Bains*, *Gaunta*, Garhwal.

A shrub or small tree with ash-coloured bark. *Leaves* 2·5 by 5·1·2 in., lanceolate, acute, entire or sparingly cuspitate-serrate towards the apex, coriaceous, gland-dotted, glabrous; petiole 1·3 in. long. *Flowers* 1 in. diam., in dense axillary fascicles; pedicels 2·3 in. long, glabrous. *Calyx* persistent, half the length of the corolla-lobes. *Style* short. *Berry* the size of a small pea, generally clustered, globose, red, shining; seed solitary, globose.

OUTER HIMALAYAN RANGES and valleys in JAUNSAIR and TEHRI-GARHWAL up to 6,000 ft.: Sansarū Khālā, Mussoorie; Korwā, Chakrata, Dhārāgādh, etc.

Wood compact, heavy, hard and handsome, and said to be esteemed in Nepal for carpenter's work; weight 50 lbs. per c. ft. Fl. and fr. Cold season.

3. *Embelia*, Burm.

1. *E. robusta*, Roxb.: Fl. Br. Ind. iii. 515; Brandis For. Flora 284, Ind. Trees 416; Gamble Man. Ind. Timb. 440. Vern. *Uāā*, Dūn.

A large scrambling shrub; bark brown, with horizontal cracks and numerous lenticels on the branches. *Leaves* 5·7 by 2·3 in., obovate-oblong elliptic or oblanceolate, short-acuminate, undulate, sometimes obscurely serrulate, usually rusty-pubescent beneath; lateral nerves 6·12 pairs, prominent, arcuate; base cuneate; petiole glandular, usually channelled. *Flowers* small, mostly dioecious, in axillary and terminal simple or fascicled racemes. *Calyx* free, deeply 5-lobed, persistent. *Petals* 5, oblong, reflexed, puberulous. *Stamens* 5, adnate to the petals. *Ovary* superior, globose; ovules few, embedded in a fleshy placenta; style short, persistent. *Fruit* a dry berry, globose, red, more or less longitudinally ribbed, crowned with the remains of the style; seed usually solitary, globose, with a hollowed base.

Common in the DŪN and SAHARANPUR FORESTS: Lachiwāla-Pardūni, Dharmāwāla, Mohkumpur; Kasūmri, etc.

The fruit has the same vernacular name and economic use as those of *Myrsine africana*.

Fl. July-Sept. Fr. Cold season.

4. *Ardisia*, Swartz.

1. *A. solanacea*, Roxb.: Syn.—*A. humilis*, Vahl. (*ex parte*). Fl. Br. Ind. iii. 529; Brandis For. Flora 287, Ind. Trees 418; Gamble Man. Ind. Timb. 441.

A larger glabrous shrub. *Leaves* 4-8 by 1·5-3·5 in., obovate-oblong or elliptic, acute or short-acuminate, entire, coriaceous, fleshy; lateral nerves not very conspicuous; base cuneate; petiole marginate. *Flowers* 2-sexual, rose-coloured or pinkish-white, about ·5 in. across, in axillary corymbose racemes; pedicels 1-2 in. long in the fruit, somewhat shorter in flower; bracts deciduous. *Calyx-lobes* 5, obtuse, oval or rounded, slightly enlarged in fruit. *Corolla* deeply 5-lobed; segments acute, twisted to the right in bud. *Stamens* 5; filaments short; anthers acute. *Ovary* free, 1-celled, tapering; style long, persistent. *Fruit* globose, the size of a large pea, black when fully ripe, full of a pink juice.

Fairly common in the damper parts of the DÚN FORESTS, especially along shady ravines.

Wood soft, used only for fuel.

Fl. in all seasons, but chiefly Mar., April. Fr. generally cold season.

A. floribunda, Wall. : Brandis Ind. Trees 418; Syn. *A. nerri-folia*, Wall. : Fl. Br. Ind. iii. 522,—has also been collected in Mussoorie and Birani Naddi near Dehra Dun. It is a large shrub or small tree with young shoots and inflorescence minutely rusty-tomentose. *Leaves* narrowly oblong-lanceolate, entire, 5-7 in. long by 1-1·25 in. broad, lateral nerves obscure. *Flowers* small, red, in terminal compound panicles; *bracts* linear. *Calyx-lobes* ·1 in. long, ovate, acute, minutely rusty. *Berry* ·25 in. diameter, deep red, globose-pentagonal, scarcely depressed. Fl. May.

LI. SAPOTACEÆ.

Trees or shrubs, often with milky juice. *Leaves* alternate, simple, entire, coriaceous, generally exstipulate. *Flowers* bisexual, axillary, solitary or clustered, bracts minute or none. *Calyx-lobes* 4-8 and imbricate or multiseriate with the outer series valvate. *Corolla-tube* short; lobes as many, or 2-4 times as many, as the calyx-lobes. *Stamens* upon the corolla-tube, as many as the corolla-lobes or as the lobes of the inner series

and opposite to them, or numerous in 1-3 series, sometimes alternating with staminodes; filaments short; connective often produced. *Ovary* superior, 2-8-celled, with a solitary anatropous ovule in each cell. *Fruit* a berry. *Seeds* 1-8, ellipsoid, often compressed, exalbuminous and with large fleshy cotyledons, or albuminous and with flat cotyledons; testa usually crustaceous.

1. *Bassia*, Linn.

Trees with milky juice. *Leaves* stipulate; stipules caducous. *Flowers* on axillary, generally fasciculate pedicels. *Calyx* deeply 4-8-lobed; lobes biseriata, the outer lobes valvate, the inner sub-imbricate in bud. *Corolla-tube* ovoid or campanulate, lobes 5-14, contorted in bud. *Stamens* at least twice as many as the corolla-lobes, all fertile; anthers cordate, acute, with a mucronate connective. *Ovary* villous, usually 6-8-celled; style long-exserted, persistent. *Fruit* an oblong or globose berry, 1-3-seeded, exalbuminous; cotyledons fleshy, oily.

Analysis of the Species.

- | | |
|--|--------------------------|
| Corolla-tube fleshy, lobes erect; anthers | |
| not exserted | 1. <i>R. latifolia</i> . |
| Corolla-tube not fleshy, lobes spreading; | |
| anthers exserted | 2. <i>B. butyracea</i> . |

1. *B. latifolia*, Roxb.; Fl. Br. Ind. iii. 544; Brandis For. Flora 289, Ind. Trees 26; Gamble Man. Ind. Timb. 447. Vern. *Mauwá*, *Mahuá* or *Mohwá*, Hind.

A large deciduous tree; young parts pubescent; bark grey or blackish, with shallow wrinkles and vertical cracks. *Leaves* clustered at the ends of the branches, 5-7 by 3-4 in., elliptic or oblong-elliptic, short-acuminate or obtuse, coriaceous, densely woolly beneath when young, glabrescent afterwards; main lateral nerves

10-12 pairs; base cuneate; petiole 1-1.5 in.; stipules subulate. *Flowers* numerous at the ends of the branches, on drooping woolly pedicels 1-1.5 in. long. *Calyx* coriaceous, densely rusty-tomentose; lobes 4, rarely 5. *Corolla* .6-.8 in. long, fleshy and juicy, cream-coloured, early caducous; tube ovoid; lobes 7-14, usually 8-9, short, erect. *Stamens* generally 24-26; anthers hairy at the back, subsessile, inserted in 3 series inside the corolla-tube. *Berry* ovoid, fleshy, green, 1-2 in. long, 1-4 seeded.

Not very common in the area covered by this Flora. Occurs sporadically at Kalsi in JALNSAR, at Dūdhli, Phāndowāla and Sāinkōt in the DŪN, and about Beribara in the SAHĀRANPUR DISTRICT.

Heartwood scanty, reddish-brown, very hard, close- and even-grained, tough and durable, and seasons well; weight about 65 lbs. per c. ft. But the tree is so much prized for its flower and fruit that it is rarely felled. The flowers are eaten raw or cooked, or made into sweetmeats. A coarse and strong spirit is also distilled from them. The fruit is eaten and gives, when expressed, a thick oil which is eaten, burned in *chiraghs*, and is also used to adulterate ghee. The oil-cake is used to poison fish.

leafless Feb.-Apr. Fr. Mar., Apr. Fr. June, July.

2. *B. butyracea*, Roxb.; Fl. Br. Ind. iii. 546; Brandis For. Flora 290, Ind. Trees 427; Gamble Man. Ind. Timb. 448. Vern. *Chiura*, Dūn; *Phulwārā*, *Phulel*, *Phulod*, Hind.

A large deciduous tree with dark-grey bark. *Leaves* 6-12 by 4-7 in., obovate or obovate-oblong, coriaceous, soft-tomentose beneath, crowded near the ends of the branches; lateral nerves 15-20 pairs; base rhomboid; petiole 1-1.5 in. long; stipules minute, caducous. *Flowers* on drooping tomentose pedicels 1-1.3 in. long, crowded below the terminal leaves in the axils of the lower ones. *Calyx* coriaceous, rusty-tomentose, deeply 5-cleft; lobes .3-.5 in. long. *Corolla* pale-yellow; tube .7 in. long, cylindrical, not fleshy; lobes 8-10, spreading. *Stamens* 30-40; anthers exerted, not hairy. *Berry* ovoid, smooth, 1 in. long, 1-3-seeded.

It has only been found at Tapoban in the EASTERN DŪN and may possibly be found in the inner hills of TEHRĠ-GARHWAL. There are no specimens in Herb. Dehra from this area.

The tree is valued for its fruit, from the seeds of which a vegetable butter is extracted. It makes good soap, and made into candles is said to burn without smoke or unpleasant smell. It is used as an external application for headache and for rheumatism. The oil-cake, as also the pulp of the fruit, is eaten. The sweet juice

of fresh corolla is expressed and boiled into *gur* which is much prized in Kumaon.

Fl. Nov.-Jan. Fr. June. July.

To this Family belong the following which are cultivated in gardens in SAHARANPUR and the DUN :—

Bassia longifolia, Linn. ; Fl. Br. ind. iii. 544.—A large tree with elliptic-lanceolate leaves and dark yellowish-grey bark. *Flowers* pale-yellow and fleshy with the same uses as for *B. latifolia*. It is indigenous to South India.

Mimusops Elengi, Linn. ; Fl. Br. Ind. iii. 548. Vern. *Maul-sári*, Hind.,—the fragrant flowers of which are used in Indian perfumery.

Also *Mimusops hexandra*, Roxb. ; Fl. Br. Ind. iii. 549, Vern. *Khirai*, Hind.,—noted for its edible fruit and useful timber.

LII. EBENACEÆ.

Trees or shrubs. *Leaves* alternate, entire, exstipulate. *Flowers* axillary, regular, usually diœcious generally bracteate, solitary or in small cymes. *Calyx* inferior, gamosepalous, often accrescent in fruit. *Corolla* gamopetalous. *Stamens* as many, or 2 3 times as many, as the corolla-lobes, free or variously united, absent or rudimentary in the female flowers ; anthers linear, erect, introrse, with the connective usually prolonged beyond them. *Ovary* superior, 2 or more-celled, with usually one pendulous ovule in each cell ; styles 2-8, distinct or connate at the base. *Fruit* an indehiscent, coriaceous or fleshy berry ; seeds few, pendulous, albuminous ; cotyledons foliaceous.

1. **Diospyros**, Linn.

Trees, rarely shrubs. *Leaves* alternate, sometimes subopposite, entire. *Flowers* dioecious, rarely polygamous, the female often solitary. *Calyx* lobed; lobes often accrescent in fruit. *Corolla* tubular or urceolate, deeply lobed; lobes twisted to the right. **MALE FLOWERS**: *Stamens* 4-16 or more: ovary rudimentary. **FEMALE FLOWERS**: *Staminodes* 0-16. *Ovary* usually 4-5-celled; ovules solitary in each cell. *Fruit* generally pulpy, 1-10-seeded. *Seeds* usually compressed; albumen uniform or ruminated.

Analysis of the Species.

Leaves always alternate.

Leaves glabrescent, fruit glabrous.

Branchlets often spinescent; leaves oblong, base cordate; bark rough . . . 1. *D. cordifolia*.

Branchlets not spinescent; leaves elliptic, base not cordate; bark smooth . . . 2. *D. montana*.

Leaves quite glabrous; fruit densely rusty . . . 3. *D. Embryopteris*.

Leaves opposite or subopposite, broad-ovate . . . 4. *D. tomentosa*.

D. cordifolia, Roxb.: Cor. Pl. i. 38, t. 50.—Syn. *D. montana*, Roxb. (in part); Fl. Br. Ind. iii. 555; Brandis For. Flora 296, Ind. Trees 431; Gamble Man. Ind. Timb. 454. Vern. *Bis Tendu*, Hind.; *Chambér*, Saháranpur.

A large shrub with a short trunk and a broad rounded dense crown, often spinescent. Bark thin smooth pinkish or bluish-grey on branches, dark-grey or almost black and deeply cracked on old stems. *Leaves* 2-4 by 1-1.5 in., oblong, soft, membranous or subcoriaceous, light-green, pubescent or glabrescent; nerves slender; base cordate or rounded; petiole .2 in. or less. **MALE FLOWERS** in bracteate 3-flowered cymes. *Calyx* 4-cleft; lobes ovate. *Corolla* urceolate, with 4 short lobes. *Stamens* 16, in two series, glabrous; anthers not awned. **FEMALE FLOWERS** solitary, nodding, larger than the male flowers; pedicels with a pair of bracts at the apex

Calyx deeply 4-fid; lobes ovate. *Staminodes* 4-12 in one series. *Ovary* glabrous, 8-celled, 1 ovule in each cell. *Fruit* globose, .5-1.2 in. diam., yellow when ripe, supported by the accrescent leathery calyx. *Seeds* compressed; albumen uniform.

Common in the lower SAHÁRANPUR FORESTS and also found occasionally in the DÚN, e.g., Tháno, Lachiwála, etc.

The wood is hard and durable and is variegated with black and white streaks. It would perhaps be good for furniture, but at present there is no demand except for fuel. Heartwood not distinct, weight about 45 lbs. per c. ft. Every part of the tree, including the fruit, is bitter and has an unpleasant smell.

Fl. Mar.-May. Fr. Cold season.

Following the Flora of British India this tree was described as *D. montana* in the first edition of this book, but Roxburgh's distinction appears to be well founded and I have followed Col. Beddome and Mr. Duthie (*Ind. Forester* XXXI, 308) in keeping *D. cordifolia* distinct.

D. montana, Roxb.; Fl. Br. Ind. iii. 555 (in part); Gamble Man. Ind. Timb. 454 (in part); Brandis Ind. Trees 431 (in part); Syn.—*D. Kanjiluli*, Duthie in Ind. For. XXXI (1905), 307; Brandis Ind. Trees 432, 713. Vern. *Pinna*, Malkot.

A small or middle-sized tree with a fairly long trunk and greenish or ashy-grey smooth bark; branches forming a narrow and open crown, not spinescent. *Leaves* 1.5-5.5 by 1.2 in., generally elliptic or ovate-oblong, dark-green, densely velvety-tomentose when young, almost glabrous and rather coriaceous when mature base usually rounded; midrib impressed above but prominent beneath, lateral nerves faint, arcuate; petiole .15-.4 in. long. **MALE FLOWERS** in short 3-5-flowered axillary cymes; pedicels .06 in. long; bracts ovate, subacute, ciliate on the margins. *Calyx-lobes* broad and rounded, pubescent on both sides and with ciliate margins. *Corolla* .2-.3 in. long, pale green, slightly pubescent outside, glabrous within. *Stamens* 16, in opposite pairs, united at the base; anthers awned, glabrous. **FEMALE FLOWERS** solitary, axillary, nodding, dark-green; pedicels .1-.2 in. long. *Calyx* accrescent in fruit; lobes spreading, broader than in the preceding species. *Corolla* .2 in. long, urceolate, dark-green. *Staminodes* 4 or 8, alternately longer, the longer ones often toothed at the apex, the shorter obtuse. *Fruit* up to 1 in. diam., globose, red when ripe. *Seeds* generally 8 in each fruit, about .5 in. long, compressed, somewhat curved; albumen uniform.

Fairly common in certain localities, e.g., below Sáia and the Jumna Valley in JAUNSAAR; Kálsi, Rájpur and Málkot in the OUTER

HILLS : Lachiwála and Tháno in the DÚN ; and Ranipur, Dholkhand, Mohand and Bádsháhibágh along the foot of the SÍWALIKS.

Wood brownish-grey with occasional iron-grey streaks, fine- and close-grained, moderately hard ; no distinct heartwood ; weight 50 lbs. Used for agricultural implements in Málkôt.

Fl. Apr., May. Fr. Cold season.

D. Kanjilali, Duthie has been referred to *D. montana*, Roxb. by Mr. Haines in " Botany of Behar and Orissa ", p. 516, by Mr. Parker in " A Forest Flora for the Punjab, etc. ", p. 314, and by Mr. A. E. Osmaston in " A Forest Flora for Kumaon ", p. 324, and I have followed these authors in including it under *D. montana*, Roxb. I have tried to find any constant satisfactory characters to distinguish between them by examining a large number of specimens but have failed to do so. At best *D. Kanjilali* can only be considered a form of *D. montana* with more coriaceous leaves.

3. **D. Embryopteris**, Pers. ; Fl. Br. Ind. iii. 556 ; Brandis For. Flora 298, Ind. Trees 434 ; Gamble Man. Ind. Timb. 455. Vern. *Gáb, Kálá Tendu*, Hind

A middle-sized evergreen tree, with dark-green shining foliage, and dark-grey or greenish-black bark. *Leaves* distichous, 5-8 by 1.5-2 in., oblong, subacute, coriaceous, smooth, shining ; base obtuse ; petiole wrinkled, .5 in. long. *Flowers* tetramerous, scented, white or cream-coloured. MALE FLOWERS in short pedunculate cymes of 3-6 flowers. *Stamens* many, hairy. FEMALE FLOWERS 1-5 together, subsessile, larger than the male flowers. *Staminodes* up to 12. *Ovary* 8-celled ; styles 4, lobed at the tips. *Fruit* subglobose, 1.5-2 in. diam., glandular or rusty, supported on the much accrescent calyx, yellow when ripe. *Seeds* 5-8, compressed, embedded in a glutinous pulp, often rudimentary under cultivation.

Found in the DUN in moist shady localities, e.g. Khairi Forest, Jogiwála, Ambári, Báronwála, etc. Also in ravines in the Kálsi Forest. Cultivated in DEHRA.

Wood white, moderately hard and close-grained, used for building. Heartwood not distinct, weight 52 lbs. per c. ft. Round the seeds of the ripe fruit, filling the cells, is a honey-like sweet substance which is eaten. The same substance in the unripe fruit is used as gum in book-binding, and in place of tar for paving the seams of country boats. An infusion of the pulp of unripe fruit is used to render fishing nets and lines durable. The extract of the fruit is used in medicine as an astringent. The oil extracted from the seeds is also used in country medicine.

Fl. June-Aug. Fr. Apr., May.

4. *D. tomentosa*, Roxb.; Fl. Br. Ind. iii 564; Brandis Ind. Trees 433; Gamble Man. Ind. Timb. 460. Syn.—*D. Melanozylon*, Roxb.; Brandis For. Flora 294. Vern. *Tendu*, Hind.

A moderate-sized tree with greyish-black bark, exfoliating in regular rectangular scales: young parts covered with grey or rusty tomentum. *Leaves* alternate and subopposite, 3-6 by 2-5 in., broad-ovate, very coriaceous, hairy when young, glabrous above when mature, ultimately glabrescent below; secondary nerves 6-10 pairs, impressed as broad furrows on the upper surface; base cordate or rounded, rarely cuneate; petiole .3-5 in. long. **MALE FLOWERS** sub-sessile in short drooping cymes. *Calyx* funnel-shaped. *Stamens* 12-16, free. **FEMALE FLOWERS** solitary, larger than the male flowers. *Calyx* 4-5-gonal. *Staminodes* 8-10 or fewer, sometimes connate in pairs. *Ovary* hairy, 4-8-celled; styles 2-3. *Fruit* globose, 1-1.5 in. diam., glabrous, smooth, yellow when ripe; pulp yellow, sweet, aromatic. *Seeds* 4-8, compressed, oblong; albumen ruminated.

Common in the western half of the SAHARANPUR SIWALIKS occasionally found in the W. DUN SIWALIKS.

Wood hard, of a whitish-pink-colour, tough and fairly durable, used for building, shoulder-poles, mine-props and shafts of carriages. In some trees irregular masses of black ebony is found, which is very heavy, weighing 75-80 lbs. per c. ft. and is used for carving and other ornamental work. The ripe fruit is edible. The tree coppices very well, and throws out vigorous root-suckers.

Fl. May, June Fr. Apr. and May, next year

Diospyros Kaki, Linn. f. The Persimon. A small deciduous tree with broadly elliptic or elliptic-ovate leaves; male flowers in 3-flowered cymes, female flowers solitary. *Fruit* globose 1-3 in. diameter, reddish or yellow, sometimes scarlet when ripe. It is indigenous to Japan and is cultivated in gardens for its fruit.

VIII. STYRACEÆ.

Trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* hermaphrodite, regular, usually white. *Calyx-tube* more or less adnate to the ovary; limb 4-5-toothed or truncate, persistent. *Petals* 4-5, united into a short tube or almost free. *Stamens* usually in-

definite, attached to the corolla-tube in one or more series. *Ovary* inferior or superior, 2-5-celled, with 2 or more ovules in each cell. *Style* undivided, filiform; stigma small or capitate. *Fruit* drupaceous, usually 1-seeded. *Seeds* albuminous.

1. *Symplocos*, Linn.

1. *S. cratægoides*, Ham.; Fl. Br. Ind. iii. 573; Brandis For. Flora 299, Ind. Trees 440; Gamble Man. Ind. Timb. 464. Vern. *Lôdh*, *Lôdra*, Jaunsar; *Lôdhra*, Sans.

A large shrub or small tree; bark light-grey, corky, with long vertical furrows. *Leaves* 2-4 by 1-1.5 in., broad-elliptic or ovate, acuminate, sharply glandular-serrulate towards the apex, membranous, pilose beneath or glabrescent. *Flowers* white, .25 in. diam., fragrant, in cymose corymbs forming dense terminal or axillary panicles; bracts caducous. *Calyx* turbinate, lobes ciliate. *Corolla* 5-cleft nearly to the base. *Stamens* indefinite, connate in 5 bundles. *Ovary* inferior, 2-celled. *Fruit* .12-.3 in. long, obliquely ovoid or obovoid, crowned with the remains of the calyx-limb, usually 1-seeded. *Embryo* curved, axile.

JAUN SAR, TEHRI-GARHWAL, and the OUTER HIMALAYA, 3,900 ft., e.g., Deoban, Lohâr, Bagur Block (Kathiân), Tons Valley; Mautârgâdh, Lûnâgâdh; Ladûakot, etc. Also Mothron-wâla swamp in the DUN.

Wood white, hard and close-grained, but warps and splits in seasoning; weight 45-54 lbs. per c. ft. It is, however, fairly durable and has been recommended for turning, and would do even for carving if properly seasoned. The leaves and bark give a yellow dye, the former being also lopped for fodder.

Fl. and new leaves May, June. Fr. July-Oct.

Order 6.—GENTIANALES.

LIV. OLEACEÆ.

Erect or scandent shrubs, or trees. *Leaves* opposite (except in *Jasminum humile*), simple, 3-foliolate or

imparipinnate, exstipulate. *Flowers* regular, in axillary or terminal cymose panicles, rarely solitary. *Calyx* free; limb 4-5- or more-toothed or lobed, sometimes truncate, rarely 0. *Corolla* gamopetalous; lobes 4-5 or more or none, imbricate or valvate in bud; tube narrow. *Stamens* 2, inserted on, and included in, the corolla-tube; filaments usually very short. *Ovary* free, 2-celled, with usually 1-2 ovules in each cell; style simple, long or short; stigma simple or 2-lobed. *Fruit* succulent or dry, berry-like capsular or drupaceous; seeds 1 or 2 in each cell, erect or pendulous; albumen fleshy or horny, or 0.

Analysis of the Genera.

- Corolla-lobes much imbricate
 - Scandent shrubs. Fruit a berry 1. JASMINUM.
 - Erect small tree. Fruit a 2-valved capsule 2. NYCTANTHES.
- Corolla-lobes induplicate-valvate or 0.
 - Leaves imparipinnate; (fr. samaroid, indehiscent) 3. FRAXINUS.
 - Leaves simple.
 - Fruit a capsule 4. SYRINGA.
 - Fruit a drupe.
 - Inflorescence axillary: petals more or less connate in pairs or distinct 5. LINOCIERA.
 - Inflorescence axillary (except in *O. glandulifera*); corolla with a short tube 6. OLEA.
 - Inflorescence terminal; corolla funnelshaped 7. LIGUSTRUM.

1. **Jasminum**, Linn.

Shrubs usually scandent. *Leaves* opposite (except in *J. humile*), simple, 3-foliate or imparipinnate; petiole usually articulated. *Flowers* fragrant, in axillary or terminal cymes; bracts sometimes petaloid.

Calyx 5-9-fid : tube funnel-shaped ; teeth long or short or 0. *Corolla* white, pink or yellow ; tube narrow ; lobes spreading, imbricate in bud. *Stamens* 2, included in the tube ; connective usually produced and triangular. *Ovary* 2-celled ; ovules basal, usually 2 in each cell ; style cylindrical ; stigmas 2, linear. *Berry* 2-lobed or entire by the failure of 1 carpel ; seed usually 1 in each carpel, erect, exalbuminous.

Analysis of the Species.

Leaves opposite ; flowers white.

Leaves simple.

Cymes dense ; flowers sessile : calyx-teeth nearly as long as the corolla-tube 1. *J. pubescens*.

Cymes lax ; flowers pedicellate ; calyx-teeth less than half the length of the corolla-tube 2. *J. arborescens*.

Leaves imparipinnate.

Calyx-teeth very short, triangular 3. *J. dispersum*.

Calyx-teeth long, linear.

Leaflets 3-7 : corolla-tube .5-.7 in. long 5. *J. officinale*.

Leaflets 7-11 ; corolla-tube .7-1 in. long 6. *J. grandiflorum*.

Leaves alternate, imparipinnate ; flowers

yellow (calyx-teeth very short) 4. *J. humile*.

1. ***J. pubescens***, Willd. ; Fl. Br. Ind. iii. 592 ; Brandis Ind. Trees 449 ; Gamble Man. Ind. Timb. 468. Syn.—*J. hirsutum*, Willd. ; Brandis For. Flora 312. Vern. *Chameli*, Hind.

A scandent shrub ; branches and young parts villous. *Leaves* opposite, simple, 1-3 by .7-1.5 in., ovate, acuminate, entire, more or less pubescent beneath ; base rounded or cordate, rarely slightly cuneate ; petiole .2-.4 in. long, pubescent. *Flowers* scented, white, subsessile, in compact short pedunculate cymes. *Calyx-teeth* usually 7-9, linear, hairy, nearly as long as the corolla-tube. *Corolla tube* .7-.8 in. long ; lobes oblong-lanceolate, shorter than the tube. *Fruit* of 1 or 2 carpels, globose or elliptic, surrounded by the calyx-teeth, black when ripe.

Common in the DUN, especially in hedges outside villages, also along the foot of the SAHARANPUR SIWALIKS.

Fl. Dec.-Apr. and also during the rains.

2. *J. arborescens*, Roxb.; Fl. Br. Ind. iii. 594; Brandis For. Flora 311, Ind. Trees 450; Gamble Man. Ind. Timb. 467. Vern. *Chameli*, Hind.

A large shrub, usually suberect. *Leaves* opposite, simple, 3-5 by 2-3 in., ovate, acute or acuminate, entire, soft-tomentose when young, glabrate afterwards; base broadly rounded, sometimes cordate; petiole .5-.8 in. long. *Flowers* white, fragrant, in lax terminal trichotomous cymes; pedicels .2-.3 in. long; bracts .2 in., linear. *Calyx-lobes* 5-6, sometimes more, linear, .1-.15 in. long. *Corolla-tube* .5 in., lobes usually 9, .7 in. long, lanceolate, acute. *Fruit* generally of 1 carpel, .4-.6 in. long, ellipsoid, black when ripe.

Fairly common in the WESTERN DUN, e.g., Ambári, Kálsi, etc.; also along the foot of the SAHARANPUR SIWALIKS; Ránpur, Bádsháhibágh, etc.

Fl. April, May. Fr. June, July.

Var. *latifolia*, Roxb. is scandent. Found about Ambári, W. DUN.

3. *J. dispernum*, Wall.; Fl. Br. Ind. iii. 602. Brandis For. Flora 312, Ind. Trees 452.

A glabrous scandent shrub; branches 4-sided. *Leaves* opposite, imparipinnate, upper often 1-foliate. *Leaflets* 3-5, cordate-lanceolate, acuminate, entire, coriaceous, glabrous, 3-5-nerved at the base, terminal 3-4 by 1.4-1.8 in., lateral smaller and very shortly petioluled. *Flowers* white, fragrant, both in few-flowered axillary cymes and many-flowered elongated terminal panicles; pedicels 0.3 in. *Calyx-teeth* .0.4 in., triangular. *Corolla-tube* .5-.7 in. long; lobes .2-.3 in., elliptic or ovate. *Berries* .5 in. long, ellipsoid, dark-purple when ripe.

Bindál-nálá and other ravines in the DUN, less common than *J. pubescens*. Also Chatragádh in JAUNSAIR.

Fl. May, June. Fr. Sept., Oct.

4. *J. humile*, Linn.; Fl. Br. Ind. iii. 602; Brandis Ind. Trees 452; Gamble Man. Ind. Timb. 468. Syn.—*J. revolutum*, Sims.; Brandis For. Flora 313. Vern. *Shanjoi*, *Shunjai*, Jaunsar.

An erect small shrub, wholly glabrous; branches angular, green; bark soft. *Leaves* alternate, imparipinnate. *Leaflets* 1-5 pairs, 2-3 by .7-1.2 in., variable in size, ovate or ovate-lanceolate, the

terminal usually the largest. *Flowers* dimorphic, yellow, fragrant, in short terminal compound corymbose cymes. *Calyx-teeth* 5, very short. *Corolla-tube* .5-.8 in. long; lobes 5, ovate, obtuse. *Berries* ellipsoid, .3-.4 in. long.

Common in the OUTER HIMALAYA, JAUNSAK, and TEHRI-GARHWAL, 4,000-9,500 ft.

Fl. Apr.-June. Fr. Sept.-Dec.

5. **J. officinale**, Linn.; Fl. Br. Ind. iii. 603; Brandis Fl. For. Flora 313, Ind. Trees 452; Gamble Man. Ind. Timb. 467. Vern. *Hol-láli*, Jaunsar. The White Jasmine.

A large twining shrub, branches long, weak, dark green, slightly ribbed. *Leaves* opposite, imparipinnate; rachis channelled. *Leaflets* 3-7, 2-3 in. long, rhomboid or lanceolate, the terminal largest. *Flowers* white, fragrant, about .8 in. long, in few-flowered corymbose terminal cymes; pedicels 0-.7 in. *Calyx-teeth* linear, very variable in length. *Corolla-tube* .5-.7 in. long; lobes 5, .3 by .2 in., acute. *Berries* .3 in. long, subglobose.

JAUNSAK and TEHRI-GARHWAL, 4-,9,000 ft.; Korwá, Deoban, Mundáli, etc.

Fl. May, June. Fr. Oct., Nov.

6. **J. grandiflorum**, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 313, Ind. Trees 452; Gamble Man. Ind. Timb. 469. Vern. *Chambéli*, Jaunsar; *Joi*, Garhwal. The Spanish Jasmine.

A large glabrous scandent shrub, suberect in early life; branches ribbed. *Leaves* opposite, imparipinnate; leaflets 7-11, sessile, the upper pairs generally confluent with the terminal leaflet; petiole marginate. *Flowers* white, with faint pink streaks outside; delightfully fragrant, in lax terminal cymes, rarely solitary and axillary; pedicels slender, .3-1 in. long. *Calyx-teeth* linear, half to two thirds the length of the corolla-tube. *Corolla-tube* about 1 in.; lobes usually 5, about .5 in. long, elliptic. *Berries* of 2 carpels, ellipsoid, .3 in. long.

JAUNSAK and TEHRI-GARHWAL up to 8,500 ft., e.g., Mundáli, Deotá, Lambátách, etc., especially conspicuous at Bodayár.

Fl. May-July.

Jasminum Sambac, Ait.; Fl. Br. Ind. iii. 591; Vern. *Motiya*, *Mogra*. A straggling shrub with broadly ovate or elliptic leaves 1.5-3 in. long and white fragrant flowers, corolla usually double—is much cultivated in gardens both in Dehra Dun and Saharanpur.

2. *Nyctanthes*, Linn.

1. **N. Arbor-tristis**, Linn.: Fl. Br. Ind. iii. 603; Brandis For. Fl. 314, Ind. Trees 442; Gamble Man. Ind. Timb. 469 Vern. *Kárrí*, Dún: *Harsingár*, Hind.

A small deciduous tree with quadrangular branches and grey or greenish-white rough bark. *Leaves* opposite, 4-5 by 2-5-3 in., ovate, acute, coriaceous, covered with stiff white hairs; base rounded or emarginate; petiole .2-5 in. long. *Flowers* sweet-scented, sessile, 3-7 together in pedunculate heads which are arranged in short trichotomous cymes; bracts elliptical. *Calyx-tube* .2 in., minutely 4-5-toothed. *Corolla-tube* 5-5 in. long, cylindrical, orange-red; limb white, spreading; lobes 5-8, .2-3 in. long, emarginate, contorted in bud. *Anthers* 2, subsessile, inserted near the mouth of the corolla-tube. *Ovary* 2-celled; ovule 1 in each cell, erect. *Capsule* .3-5 in. long, orbicular, compressed, chartaceous, 2-celled; seeds exalbuminous.

Extremely common in the forests of the SAHÁRANPUR SIWÁLIKs, and in some parts of the DÚN, as on the Nagsidh Hill and the southern slopes of the HIMALAYA, e.g., at Málkôt, Rájpur, etc. Also at Kálsi in JAUNSAIR. Cultivated in gardens for its flower.

The wood is used only for fuel. The leaves are used for polishing wood and also in country medicine as a febrifuge. The flowers are collected and dried to separate the white corolla-lobes which are then winnowed out, leaving the tubes, from which an orange dye is extracted.

Fl. Aug.-Oct. Fr. Cold season.

3. *Syringa*, Linn.

1. **S. emodi** Wall.: Fl. Br. Ind. iii. 605; Brandis For. Flora 306, Ind. Trees 445; Gamble Man. Ind. Timb. 470. Vern. *Shaphroi*, Jaunsar.

A large deciduous shrub; branches lenticellate. *Leaves* 3-4 by 1-5-2 in., elliptic-oblong, short-acuminate, entire, slightly pubescent beneath when young, glabrate and pale beneath when mature; base acute; petiole .3-1 in. long. *Flowers* whitish or purple, scented, in dense-flowered thyrsoid panicles. *Calyx* subtruncate, about .1 in. long, persistent, nearly glabrous. *Corolla* trumpet-shaped; tube .2-4 in. long; lobes 4, shorter than the tube, valvate, linear-oblong; tip generally inflexed. *Stamens* 2, near the top of the corolla-tube anthers half-exserted. *Ovary* 2-celled; ovules 2 in each cell, pendulous; stigma bifid. *Fruit* a coriaceous capsule, .5-7 in. long,

cylindrical, acute, slightly bent, loculicidally 2-valved; seeds pendulous, linear-oblong, flat, ridged along the middle, winged all round.

TEHRI-GARIHWAL, JAUNSAH, and SIMLA HILL STATES, 8, 11,900 ft.: Jodi and Bījāmarā blocks, Chāchpur Range, etc.

Wood white, even and close-grained. The leaves are used as fodder for goats; cultivated in gardens for its flower.

Fl. May-July. Fr. Sept., Oct.

4. *Fraxinus*, Linn.

1. *F. micrantha*, Lingelsh. in Engl. Botanische Jahrb. XL (1908), p. 217.

A large deciduous tree; bark ashy-grey; smooth on young poles, corky and deeply furrowed on mature trees. *Leaves* opposite, imparipinnate; rachis 5-8 in. long. *Leaflets* usually 7, less frequently 5 or 9, lateral opposite, 3-5 by 1-3 in. ovate oblong elliptic or lanceolate, usually long-acuminate, falcately serrate, membranous, glabrous above, pilose on the nerves beneath when young; main lateral nerves about 12 pairs, slender, joined by reticulated secondary nerves; petiolules .2-.5 in. long. *Inflorescence* a large terminal panicle; pedicels fascicled on the branches of the panicle. *Flowers* about .15 in. long, generally 2-sexual. *Calyx* minute, acutely 4-toothed, somewhat enlarged in fruit. *Petals* 0. *Stamens* near the base of the corolla tube; filaments about .1 in. long. *Ovary* 2-celled; stigma 2-fid; ovules 2 in each cell, pendulous. *Fruit* an oblanceolate samara, 1-1.5 by .2-.25 in., including the wing. *Seeds* solitary.

Cultivated IN JAUNSAH about Chakrata and in TEHRI-GARHWAL; also found indigenous in places e.g., at Phaphrota below Deoban, Bear Garden near Chakrata, and at Kūni; not very common.

Wood white, with a light reddish tinge, moderately hard and tough; no heartwood; annual rings distinct; weight 48 lbs. per c. ft. It is used for oars, ploughs, jhampan-poles, etc.

Fl. usually April, May. Fr. Aug., Sept.

This species can always be distinguished from *F. floribunda*, Wall. by the absence of petals which are always present in the latter. There are no specimens of *F. floribunda*, Wall. in Herb. Dehra from this area.

5. *Linociera*, Swartz.

1. *L. intermedia*, Wight; Fl. Br. Ind. iii. 609; Brandis Ind. Trees 448, Gamble Man. Ind. Timb. 473.

A small tree. *Leaves* 4-8 by 2-3 in., elliptic-oblong, acute at both ends, chartaceous, glabrous; main lateral nerves 10-14 pairs; reticulations prominent; petiole .5 to 1.2 in. *Inflorescence* a dense glabrous compound trichotomous panicle, generally axillary, sometimes from the middle of the internodes; bracts lanceolate, generally minute. *Flowers* whitish, male or 2-sexual, sessile or nearly so. *Calyx-lobes* .1 in., ovate, glabrous. *Petals* 4, .12-.2 in. long, narrowly oblong, slightly connate in pairs. *Anthers* sessile or nearly so. *Ovary* glabrous. *Drupe* .5-.7 by .3 in.

Only found on the edges of the Mothronwala swamp and is likely to occur in similar other localities in the DUN.

Wood white, moderately hard and close-grained.

Fl. Mar.-May. Fr. Rainy season.

6. *Olea*, Linn.

Trees or shrubs. *Leaves* opposite, simple, entire or toothed. *Flowers* often unisexual and dioecious, generally in terminal panicles. *Calyx* 4-toothed or lobed, or truncate. *Corolla-tube* short; lobes 4 or 0. *Stamens* 2, epipetalous and exserted, or hypogynous (when the corolla is wanting); anthers oblong. *Ovary* 2-celled; ovules 2 in each cell; style short. *Fruit* a drupe, ellipsoid; endocarp hard; exocarp pulpy. *Seed* solitary, pendulous; albumen fleshy.

Analysis of the Species.

- | | |
|--|-----------------------------|
| Lateral nerves indistinct, not glandular; | |
| under-surface of leaves clothed with reddish scales | 1. <i>O. cuspidata</i> . |
| Lateral nerves distinct, glandular at the axils; leaves wholly glabrous | 2. <i>O. glandulifera</i> . |

1. *O. cuspidata*, Wall.; Fl. Br. Ind. iii. 611; Brandis For. Flora 307, Ind. Trees 445. Syn.—*O. ferruginea*, Royle; Gamble Man. Ind. Timb. 474. Vern. *Kāu*, Jaunsar; *Kahu*, Hind.

A middle-sized tree; bark thin, smooth when young exfoliating in narrow strips when old. *Leaves* 2-4 in. long, oblong lanceolate, cuspidate, entire, very coriaceous, dark-green and

shining above, thickly clothed beneath with a dense film of minute red scales; margins slightly recurved; midrib prominent; petiole about .2 in. *Flowers* bisexual, whitish, in axillary trichotomous cymes 1-2 in. long. *Calyx* nearly truncate or with 4 short teeth. *Corolla* deeply divided; lobes .1 in., elliptic, obtuse or acute with a ridge along the middle, induplicate-valvate in bud. *Anthers* oval, dehiscing laterally. *Style* short; stigma bifid. *Drupe* .2-.3 in. long, ovoid, black when ripe, supported by the remains of the calyx; endocarp bony; pulp scanty, oily.

Fairly common in JAUNSAK and the OUTER HIMALAYA 3,-6,000 ft.; cultivated in DEHRA.

Sapwood whitish; heartwood light-brown to nearly black, extremely hard, often beautifully mottled; weight 65-82 lbs. per c. ft. It polishes well and is much prized for turning, for combs and for agricultural implements. Fairly straight branches are in great demand for the purpose of making into walking sticks. The fruit is eaten, and oil can be extracted from it. The leaves are heavily lopped for fodder.

Fl. April, May, and sometimes in Sept. Fr. Aug.-Nov.

2. *O. glandulifera*, Wall.; Fl. Br. Ind. iii. 612; Brandis For. Flora 309, Ind. Trees 446; Gamble Man. Ind. Timb. 474. Vern. *Gair*, *Gaidd*, Málköt.

A moderate-sized tree; branches lenticellate; bark of stem rough. *Leaves* 4 by 2 in., ovate-lanceolate, long-acuminate, entire, wholly glabrous; margins slightly undulate; base cuneate; main lateral nerves 9-12 pairs, slender, with glands at their axils on either side of the midrib; petiole .5-1 in. long. *Flowers* cream-coloured, in terminal or lateral compound trichotomous cymes. *Calyx* 4-toothed. *Corolla* deeply divided; lobes valvate, elliptic, .1 in. long. *Anthers* large. *Ovary* glabrate. *Drupe* .5 in. long, ovoid, somewhat oblique, acute at the apex; endocarp bony.

Fairly common along the OUTER HIMALAYAN TRACTS between 2,500 and 6,000 ft.: Málköt Forest, Paléd, above Rajpur, Tons Valley near Kálsi, etc. Also Mothronwála swamp in the Dún, 1,900 ft.

The wood is reddish-grey, hard and durable, weighing 54 lbs. per c. ft. It takes a good polish and is avoided by insects. It is used in construction, turnery and agricultural implements. The bark is used in medicine, and the leaves are lopped for fodder.

Fl. April, May, occasionally during the rains. Fr. Cold season.

Osmanthus fragrans, Lour.; Fl. Br. Ind. iii. 606. An evergreen shrub or small tree with lanceolate, coriaceous leaves up to 6

in. long with white or pale-yellow very fragrant flowers on long slender pedicels in axillary clusters. Cultivated in gardens in Dehra.

7. *Ligustrum*, Linn.

1. *L. compactum*, Hook. f. & Th.: Fl. Br. Ind. iii. 616 ; Brandis For. Flora 310, Ind. Trees 447 ; Gamble Man. Ind. Timb. 476. Vern. *Kakurchha*, Jaunsar.

A small tree with grey bark ; branches often lenticellate. *Leaves* 3-5 by 1-2 in., elliptic-lanceolate, coriaceous, glabrous, shining above ; petiole .2-.3 in. long. *Flowers* white, subsessile, in compound racemes, which are arranged in terminal panicles. *Corolla-tube* short, funnel-shaped ; lobes oblong, induplicate valvate. *Anthers* half-exserted. *Ovary* 2-celled, with 2 ovules in each cell ; style of varying lengths, the longest reaching to the base of the anthers ; stigma nearly simple. *Fruit* numerous, .2-.3 in. long, cylindrical, often slightly curved.

JAUNSAR and TEHRI-GARHWAL, 4,9,000 ft. ; Karambā Peak (Sir D. Brandis), Lokhār, Kathiān, Koti, Ghutugādh, Binālgādh, etc. ; cultivated in DEHRA (Kowligarh).

Wood white, moderately hard, close-grained and durable. The leaves are lopped for fodder.

Fl. April-June. Fr. Nov.-Feb.

LV. APOCYNACEÆ.

Erect or climbing shrubs, or trees, rarely herbs, usually with milky juice. *Leaves* entire, commonly opposite, sometimes whorled, very rarely alternate. *Flowers* regular, hermaphrodite, solitary or in cymes. *Calyx* inferior ; sepal. free or slightly connate at the base, generally imbricate in bud. *Corolla* hypogynous, gamopetalous, rotate or salver-shaped ; lobes spreading contorted or twisted (rarely valvate) in bud. *Stamens* 5, inserted on the tube, alternating with the corolla-lobes ; anthers opening inward by longitudinal slits, sometimes spurred downwards ; connective often adher-

ing to the stigma ; pollen granular. *Ovary* 1-celled, with 2 parietal placentas or 2-celled with axile placentas or of two distinct or more or less connate carpels : ovules 2 to many in each cell, rarely solitary ; style simple or divided only at the base. *Fruit* a drupe or a berry, or of 2 drupes, berries or follicles. *Seeds* pendulous, usually bearing a tuft of long silky hairs ; albumen fleshy or scanty, rarely 0.

Analysis of the Genera.

A. Leaves opposite or whorled.

B. Seeds naked.

Spinous shrubs, generally erect ; fr.

a 2- or few-seeded succulent berry 1. *CARISSA*.

Unarmed erect shrubs.

Leaves usually whorled, fr. drup-
aceous

2. *RAUWOLFIA*.

Leaves opposite, fr. of two, 1-
many-seeded dry or fleshy
follicles

5. *TABERNÆMONTANA*.

B' Seeds connate.

C. Trees or large erect shrubs.

Anthers included, free ; mouth
of the corolla-tube naked,
white

4. *HOLARRHENA*.

Anthers exerted, adherent to
the stigma ; mouth of the
corolla-tube with scales, usu-
ally orange

7. *WRIGHTIA*.

C' Climbing shrubs.

Corolla-lobes narrow ; carpels
distinct.

Tips of corolla-lobes deflected ;
seeds often beaked

9. *ICHNOCARPUS*.

Tips of corolla-lobes not
deflected ; seeds not
beaked

10. *TRACHELOSPERMUM*.

Corolla-lobes broad.

Flowers not more than 1 in.
across

6. *VALLARIS*.

Flowers 3 in. or more across 11. *CHONEMORPHA*.

A. Leaves whorled; seeds comose; anthers included.

Trees. Corona absent; carpels distinct

3. **ALSTONIA.**

Erect shrubs. Corona present; carpels at first connate

8. **NERIUM.**

1. *Carissa*, Linn.

1. *C. Opaca*, Stapf.; Syn.—*C. spinarum*, Auct. Pl. non Linn. Fl. Br. Ind. iii. 631; Brandis Ind. Trees 455; Gamble Man. Ind. Timb. 480. Vern. *Karaunda*, Hind.

A small thorny evergreen shrub with light-grey bark and green branchlets; spines .5-1 in. long, often forked, generally at the base of the branches. Leaves opposite, 1-1.5 by .7-1 in., ovate, acute, mucronate, glabrate or pubescent beneath, coriaceous, dark-green and shining above. Flowers white, scented, in few-flowered corymbose cymes at the ends of the branches. Calyx-teeth 5, lanceolate, ciliate. Corolla-tube .5 in. long, cylindrical; lobes 5, elliptic-lanceolate, slightly shorter than the tube. Stamens included in the corolla-tube. Ovary 2-celled, ovules 2 in each cell. Berry subglobose or elliptic, .2-3 in. long, shining or pruinose, dark-purple and juicy when ripe. Seeds 2, concavo-convex, not hairy.

Extremely common and gregarious in scrub jungles along the foot of the SAHARANPUR SIWALIKS and in open glades and stony soils (e.g., Tháno) in the DŪN; also found in the lower valleys, up to 4,000 ft., in JAUNSEAR and TEHRI-GARHWAL.

Wood hard, smooth and close-grained, and is used for turning and for making combs. It is an excellent fire-wood. The branches are in great demand for dry fences, and the leaves are greedily eaten by sheep and goats. The ripe berries have a sub-acid sweet taste, and are much eaten by men and birds.

Fl. April, June. Fr. Cold season.

C. Carandas, Linn.; Fl. Br. Ind. iii. 630. Vern. *Karaunda*, Hind—is cultivated in gardens at DEHRA and SAHARANPUR. It resembles *C. Opaca* in habit, but is usually a taller shrub with larger leaves, and much larger and usually 4-seeded fruit.

2. *Rauwolfia*, Linn.

1. *R. serpentina* Benth.; Fl. Br. Ind. iii. 632; Gamble Man. Ind. Timb. 481.

A small glabrous shrub about 2 ft. high. *Leaves* whorled, 3-7 in. long by 1-2.5 in. broad, lanceolate or elliptic-lanceolate, acute or acuminate, tapering into a short petiole up to .5 in. long, thin, bright green above, pale beneath. *Flowers* pink, in terminal or axillary, many-flowered peduncled cymes; *peduncle* 2-4 in. long; *pedicels* and *calyx* red; *calyx-lobes* 5, ovate. *Corolla* .5-.6 in. long; tube slender swollen a little above the middle; *lobes* 5, much shorter than the tube, spreading. *Disc* cup-shaped, slightly lobed. *Stamens* 5, inserted in the middle of the corolla-tube. *Ovary* of 2 connate carpels; *style* filiform; *stigma* capitate, calyptriform at the base, 2-fid at the apex; *ovules* 2, collateral in each carpel. *Drupe* .25 in., single or didymous, purplish-black when ripe.

Lachiwala; Ramgarh and other places in the Dún.

Fl. Nov., Dec., sometimes at other seasons. Various parts of the plant are used in medicine.

3. Alstonia, Br.

1. *A. scholaris*, Br.; Fl. Br. Ind. iii. 642; Brandis For. Flora 325, Ind. Trees 459; Gamble Man. Ind. Timb. 483. Vern. *Sátian*, *Chhátian*, *Chhátwán*, *Sátni*, Hind., *Saptparni*, Sans.

A tall evergreen tree with grey bark and verticillate branches; stem often fluted or buttressed. *Leaves* in whorls of 4-7, 4-8 by 1-1.5 in., obovate elliptic-oblong or oblanceolate, subsessile or narrowed into a short petiole .25-.5 in. long, coriaceous, glabrous and shining above, dull and pale-green beneath; lateral nerves numerous, straight, terminating in an intramarginal vein. *Flowers* greenish-white, in compact umbellately-corymbose cymes, the umbels whorled. *Calyx* small, 5-lobed. *Corolla* .3-.5 in. diam., villous inside; lobes rounded, spreading, twisted in bud. *Stamens* above the middle of the corolla-tube, included; anthers acute. *Ovary* of two distinct carpels. *Fruit* of two long slender follicles over a foot long and .2 in. diam., hanging in clusters. *Seeds* .3 in. long, slender, flattened, peltately attached, densely ciliate with long hairs all round.

Not very common. Has been met with on the banks of the Bidhálná Ráu and at Kalimatti, Tháno, Rikhikesh, Gularparao, Nakraunda and Kálsi.

Wood whitish, even-grained, porous, soft, light, but seasons badly; weight about 30 lbs. per c. ft. It is used in places for tea boxes and other kinds of packing-cases, and for scabbards, coffins, blackboards, etc. The bark is bitter and possesses valuable medicinal properties.

Fl. Dec.-Mar. Fr. May, June.

4. *Holarrhena*, Br.

1. *H. antidysenterica*, Wall.; Fl. Br. Ind. iii. 644; Brandis For. Flora 326, Ind. Trees 459; Gamble Man. Ind. Timb. 484. Vern. *Kura*, Hind. *Kurchi*.

A small deciduous tree with rough brown bark, exfoliating in irregular flakes. *Leaves* opposite, 6-12 by 2-5 in., elliptic-oblong, acute or acuminate, sub-coriaceous, glabrous or pubescent; lateral nerves 10-14 pairs; base obtuse or cuneate; petiole .2 in. or less. *Flowers* white or cream-colour, slightly scented, 1-1.5 in. across, puberulous, in terminal corymbose cymes which are 3-6 in. in diam. *Calyx* deeply 5-partite; lobes small, lanceolate, acuminate, with glands inside at their base. *Corolla-tube* .3-.5 in. long, cylindrical, swollen at the base round the anthers, throat contracted, naked; lobes as long as the tube, oblong, spreading, overlapping to the left. *Anthers* subsessile inserted near the base of the corolla-tube; cells rounded at the base. *Carpels* 2, distinct; ovules numerous; style short, filiform; stigma oblong. *Fruit* of 2 distinct divaricate follicles, 8-16 by .2-.4 in., spreading and incurved, smooth, usually with white specks. *Seeds* numerous, .5 in. long, linear; hairs silky, of a brownish-grey colour, 1.5 to 2 in. long.

Very common in the DÚN and SAHÁRANPUR FORESTS; also in valleys up to 4,000 ft. in JAUNSAH and TEHRI-GARHWAL.

The wood is white, soft and even-grained; weight about 40 lbs. per c. ft. It is said to be used at Saháranpur for carving. It is also used for turning and furniture, and beads are made of it to be worn round the neck as a charm. The bark, leaves and seeds are used in medicine, especially the first for dysentery, whence the specific name.

New leaves April, May. Fl. May, June. Fr. Cold season.

5. *Tabernaemontana*, Linn.

1. *T. coronaria*, Br.; Fl. Br. Ind. iii. 646; Brandis For. Flora 322, Ind. Trees 460; Gamble Man. Ind. Timb. 485. Vern. *Chándni*, Dún.

An evergreen shrub, 10-15 ft. high, dichotomously branched with silvery-grey bark. *Leaves* 4-6 by 1-1.5 in., elliptic-oblong, acuminate, rather coriaceous, shining-green above, pale beneath; margins undulate, narrowed into a short petiole .25-.5 in. long. *Flowers* pure white, fragrant, often (especially under cultivation) double. *Calyx-lobes* short, broad-ovate, acute, glandular within. *Corolla-tube* .7-1 in. long, slightly inflated in the middle; limb 1-1.5 in. diam., mouth glandular; lobes obtuse, margins overlapping, curled.

Stamens inserted about the middle of the tube; anthers acuminate. *Carpels* 2, distinct, glabrous; stigma 2-lobed. *Fruit* of two 3-ribbed somewhat fleshy cylindrical follicles, 2-3 in. long, sessile or nearly so, recurved, deep-red or orange inside. *Seeds* 3-6, oblong, with a fleshy red aril.

Valleys in the OUTER HIMALAYA, e.g., at Tháno and adjoining places, also about Rájpur. It is cultivated in gardens throughout India for its large fragrant flower.

Fl. May-Aug. Fr. Cold season.

6. *Vallis*, Burm.

1. *V. Heynei*, Spreng.; Fl. Br. Ind. ii. 650; Brandis Ind. Trees 462; Gamble Man. Ind. Timb. 486. Syn.—*V. dichotoma* Wall.; Brandis For. Flora 327. Vern. *Dudhi-bel*, *Safed-bel*, Dún.

A glabrous twining shrub; bark ash-coloured. *Leaves* opposite, 2-4 by 1-1.5 in., elliptic-oblong, acuminate, gland-dotted, glossy above; petiole .3-.6 in., with glands at the axils. *Flowers* pure-white, .7 in. across, fragrant, in lateral dichotomous cymes; pedicels slender. *Calyx* 5-partite; segments ovate-oblong, obtuse. *Corolla-limb* rotate, spreading; tube short, with a broad throat. *Stamens* woolly, inserted at the top of the corolla-tube; filaments short; anthers exerted, connivent, forming a cone with the stigma at the apex; cells rigidly spurred. *Carpels* 2, at first connate; style filiform. *Fruit* 4-6 by 1-1.5 in., tapering from a rounded base; pericarp thick. *Seeds* numerous, beaked, .6 in. long, with a tuft of hairs three times their length at the hilum.

Common in the DÚN and SAHÁRANPUR FORESTS; also in low valleys in JAUNSAAR and TEHRI-GARHWAL.

The switchy branches are used for baskets in the Saháranpur District.

Fl. Dec.-April. Fr. Jan.-April, next year.

7. *Wrightia*, Br.

1. *W. tomentosa*, Rœm. & Sch.; Fl. Br. Ind. iii. 653; Brandis For. Flora 323, Ind. Trees 461; Gamble Man. Ind. Timb. 487. Vern. *Dúdhi*, Hind.

A small deciduous tree with grey corky bark; extremities tomentose. *Leaves* opposite, distichous, 3-6 by 1.5-3 in., elliptic, caudate-acuminate, rarely obscurely serrulate, rather membranous, velvety-tomentose often on both surfaces, always beneath, narrowed into a petiole .2-.3 in. long; lateral nerves 10-16 pairs. *Flowers* 1

in. across, in many-flowered corymbose terminal cymes; bracts deciduous. *Calyx* short, with 5-10 scales inside at the base; lobes rounded, half the length of the corolla-tube. *Corolla* pale-yellow with a fleshy orange-coloured corona of scales; lobes oblong, overlapping to the left. *Stamens* inserted at the top of the corolla-tube; filaments short and broad, continued into a broad tapering connective; anthers sagittate by the cells being spurred at the base adherent to the stigma. *Ovary* of 2 connate carpels; style filiform; stigma ovoid. *Fruit* of 2 connate follicles, 8-12 by .5-.7 in., straight, cylindrical, laterally compressed, rough with white specks; follicles separating before dehiscing. *Seeds* numerous, .5-.7 in., slender, each with a tuft of pure-white silky hairs at the lower end.

Fairly common in the DÚN and SAHÁRANPUR FORESTS, and also found in the lower valleys (e.g., Binálgádh.—*Sir D. Brandis*, Dhárágádh, etc.) in JAUNSAIR. Also in outer Himalayan open valleys up to 4,000 ft. in TEHRI-GARHWAL.

Wood yellowish-white, moderately hard, close-grained, easy to work; heartwood not distinct; weight about 40 lbs. per c. ft. Used in turning, and carved into bowis, plates, combs, picture frames, etc., at Saháranpur. The bark of the stem and the roots are given as an antidote to snake-bite and the sting of scorpions. The Nepalese are said to use the milky juice to stop bleeding.

New leaves April, May. Fl. May, June. Fr. Cold season.

8. *Nerium*, Linn.

1. *N. odorum*, Soland.; Fl. Br. Ind. iii. 655; Brandis For. Flora 328, Ind. Trees 462; Gamble Man. Ind. Timb. 487. Vern. *Kanér*, Hind. The Okander.

An evergreen shrub with silvery-grey bark. *Leaves* usually in whorls of 3, 4-6 by .5-1 in., linear-lanceolate or oblong, thickly coriaceous, acuminate, smooth, dark-green and shining above, rough and dotted beneath; midrib stout; lateral nerves numerous, parallel and transverse; petiole short. *Flowers* 1-5 in. diam., red white or rose-coloured, generally sweet-scented, double under cultivation, in large terminal racemose cymes. *Sepals* broad-subulate. *Corolla* funnel-shaped; lobes spreading, overlapping to the right. *Corona-appendages* laciniate into numerous irregular segments. *Stamens* near the top of the tube; anthers sagittate, conniving around and adhering to the stigma; cells with long twisted appendages. *Fruit* 6-7 by .3-.4 in., rigid. *Seeds* linear, ribbed, villous with, and having a coma of, greyish-brown hairs.

Found in dry Ráu beds in the SAHÁRANPUR SIWALIKS, e.g., the Chápri and Ráni Ráus; not very common. Often cultivated in gardens in DEHRA and SAHÁRANPUR.

The bark and root are poisonous, and the leaves are used in native medicine.

Fl. April-June and often throughout the year. Fr. Cold season.

9. *Ichnocarpus*, Br.

1. ***I. frutescens***, Br.: Fl. Br. Ind. iii. 669; Brandis For. Flora 327, Ind. Trees 464. Vern. *Bel Kāmā*, DĀN and SAHĀRANPUR; *Kali Dūdhi*, Hind.

A twining shrub; extremities and under surface of leaves rusty-pubescent. *Leaves* 2-3 by 1.5-2 in., elliptic-oblong or ovate, lanceolate, acute or acuminate, glabrate and dark-green above, more or less pubescent beneath; petiole .2 in. *Flowers* .2-.3 in. diam. greenish-white, more or less scented, in axillary and terminal leafy cymose panicles. *Calyx* 5-cleft, with small glands inside; lobes ovate. *Corolla* hypo-crateriform, about .2 in. diam., naked inside; tube swollen round the included anthers; throat contracted, villous; lobes narrowed, hairy inside, ciliate, overlapping to the right. *Anthers* sagittate. *Fruit* of two distinct slender cylindrical follicles, 3-6 by .15 in. *Seeds* numerous, .5 in. long, slender, pendulous, each with a tuft of scanty white hairs at the hilum.

Common in the DĀN and SAHĀRANPUR FORESTS.

The thin switchy branches are used for making baskets in the Sahāranpur District, and fishing-traps in Bengal. The root is often used as a substitute for Sarsaparilla.

Fl. Aug-Nov. Fr. Feb-April.

10. *Trachelospermum*, Lemaire.

1. ***T. fragrans***, Hook. f.: Fl. Br. Ind. iii. 667; Brandis Ind. Trees 464; Gamble Man. Ind. Timb. 489. Syn. *Ichnocarpus fragrans*, Wall.; Brandis For. Flora, 327.

A tall climber, young parts pilose; old stems strongly tubercled. *Leaves* 3-5 by 1.1-5 in., elliptic-oblong, acuminate, subcoriaceous, shining above; petiole .15-.3 in. long. *Flowers* white, fragrant, in compound trichotomous corymbose cymes. *Corolla* salver-shaped, with a campanulate mouth; tube .3 in. long; lobes oblong, hairy near the base, tips not deflected, overlapping to the right, twisted to the left in bud. *Anthers* spurred at the base. *Follicles* 6-9 in. long, cylindrical, acuminate, incurved. *Seeds* .7 in. long, compressed, smooth, having a coma of white hairs.

JAUNSAH and TEHRI-GARHWAL in moist shady ravines, 3-6,000 ft.; Ramsu valley, Sendrá, Mautárgádh, etc. Also along the banks of the Rá-nadí and in the Mothronwála swamp in the Dún.

Might possibly be used for the same purposes as *Ichnocarpus frutescens*.

Fl. April-June. Fr. Oct.-Dec.

11. *Chonemorpha*, G. Don.

1. *C. macrophylla*, G. Don: Fl. Br. Ind. iii. 661; Brandis Ind. Trees 463.

A large climbing shrub with lenticellate branches; twigs hollow, pubescent. *Leaves* opposite, variable, 6-15 in. long by 5-10 in. broad, broadly elliptic, obovate or sub-orbicular, usually shortly and abruptly acuminate, base acute to subcordate, dark green and glabrescent above, pale and sparsely pubescent beneath, lateral nerves 10-12 pairs, prominent beneath; *petiole* .75-2.5 in. long, with slight scurfy pubescence. *Flowers* large, in erect, terminal, racemose, pubescent cymes, 5-9 in. long. *Calyx* usually glabrous, .45 in. long, divided about half-way down. *Corolla* salver-shaped, white, scented, 3 in. or more across; *tube* 1.2-1.7 in. long; *throat* naked; *lobes* obovate, cuneate, overlapping to the right. *Stamens* included; *anthers* about .5 in. long, spurred at the base. *Follicles* 9-12 in. long by .75 in. broad, slightly divergent at the base, glabrous

Dehra Dun in shady ravines: Robber's cave.

Fl. June-July.

The following plants belonging to this Family deserve mention:—

1. *Vinca rosea*, Linn.; Fl. Br. Ind. iii. 640. A suffruticose plant about 2-3 ft. high with opposite, deep green, polished, narrowly obovate leaves and white or rosy flowers in axillary pairs. *Corolla* salver-shaped; *tube* about .75 in. long, swollen near the top at the insertion of the stamens.

It is a native of West Indies and is commonly grown in gardens.

2. *Vinca major*, Linn. The Periwinkle. A small evergreen undershrub, branches often subscandent. *Leaves* opposite

broadly ovate, 1-2·5 in. long; pet. 25-4 in. long. *Flowers* axillary solitary on 1-2 in. long peduncles. *Corolla* salver-shaped, 1-1·25 in. long, blue; tube 5 in. long, dilated in the upper half.

Cultivated in gardens and has run wild in Barlowganj below Mussoorie. It is a native of Europe.

Fl. Dec.-Mar.

3. *Theselia nerifolia*, Juss.; Vern. *Pilá Kanér*. An evergreen shrub with narrow-linear leaves resembling those of *Nerium odorum*, and large fragrant yellow flowers. *Fruit* a 2-celled drupe. Cultivated for its flower.

4. *Plumeria acutifolia*, Poiret; Fl. Br. Ind. iii. 641; Vern. *Gúláchin*, *Gúlchin*, Dún. A soft-wooded small deciduous tree with thick fleshy branches and scattered leaves. *Flowers* white, fragrant, yellow in the centre. *Fruit* follicular; seeds winged. It is a native of tropical America but has been naturalised in many parts of India, and is much planted about temples and Mahommedan burial grounds throughout N. India.

5. *Beaumontia grandiflora*, Wall. A large evergreen climbing shrub, young shoots rusty-pubescent. *Leaves* opposite, obovate-oblong, acuminate 6-12 in. long by 3-7 in. broad. *Flowers* white, 3-5 in. long, in terminal corymbiform cymes with leafy bracts. It is a native of Nepal and is frequently cultivated in gardens.

6. *Aganosma caryophyllata*, G. Don. A large climber with ovate or elliptic, acute or shortly acuminate leaves, 3-6 in. long by 1·5-3 in. broad. *Flowers* white, in lax, pubescent, corymbose cymes, 6-8 in. in diam. *Sepal* 7-1 in. long. *Corolla* salver-shaped; tube 5-ribbed, 5 in. long. Cultivated in gardens.

LVI. ASCLEPIADACEÆ.

Herbs or shrubs, often climbing, generally with milky juice and noted for strong fibre. *Leaves* opposite, simple, entire, exstipulate. *Flowers* regular, bisexual, 5-merous, usually in axillary cymes. *Calyx* inferior,

deeply 5-lobed or divided ; segments imbricate. *Corolla-tube* short ; lobes valvate or twisted-imbricate, with a corona of scales at the throat called the *outer* or *corolline corona*. *Stamens* 5, rarely free, generally connate into a short fleshy column which usually bears a ring or series of processes that are attached to the filaments or to the back of the anthers : this is called the *inner* or *staminal corona*. (Only in rare cases are both coronas present or both absent.) *Anthers* adnate to the stigma by the connective ; pollen in granular or waxy masses which are usually united in pairs (one belonging to each contiguous anther) to glands situated at the angles of the stigma. *Ovary* superior ; carpels 2, distinct ; ovules many, in 2 series in each carpel ; styles 2, uniting in the stigma which is 5-angled. *Fruit* of two follicles, or of only one by abortion ; seeds usually compressed or flat, with a tuft of silky hairs (coma) at the hilum ; albumen copious.

Analysis of the Genera.

Filaments free ; pollen-masses granular,
in pairs in each cell.

Coronal scales free, not aristate . . . 1. CRYPTOLEPIS.

Coronal scales connate into a lobed
ring, lobes long-aristate . . . 2. PERIPLOCA.

Filaments connate into a staminal tube ;
pol.-masses waxy, solitary in each cell.

Anthers with a membranous tip.

Pollen masses pendulous.

Stem erect. Corolla-lobes val-
vate ; follicles stout, oblique . . . 3. CALOTROPIS.

Stem twining. Corolla lobes over-
lapping ; corona annular, fleshy
with truncate margin . . . 4. HOLOSTEMMA.

Pollen-masses erect or horizontal.

Stem twining. Corolla-lobes valvate; follicles slender, straight 10. HETEROSTEMMA.

Stem twining. Corolla-lobes overlapping.

Follicles stout, straight (slender acuminate in *Tylophora*.)

Corolla urceolate, salver-shaped or campanulate.

Corona on the corolla-tube 5. GYMNEMA.

Corona on the staminal column.

Cymes axillary; coronal scales simple . . . 7. MARSDENIA.

Cymes generally interpetiolar, coronal scales notched . . . 8. PERGULARIA.

Corolla rotate.

Corona scales stellately spreading, cuspidate; pollinia oblong . . . 11. DREGEA.

Corona scales fleshy; pollinia globose. . . 9. TYLOPHORA.

Follicles slender, straight. . . 6. GONGRONEMA.

Stems climbing or epiphytic; corolla valvate; leaves fleshy . 12. HOYA.

Anthers without a membranous tip.

Leafy shrubs, more or less twining . 13. LEPTADENIA.

A leafless erect shrub . . . 14. ORTHANTHEEA.

1. *Cryptolepis*, R. Br.

1. **C. Buchanani**, Roem. & Sch.; Fl. Br. Ind. iv. 5; Brandis For. Flora 330, Ind. Trees 467; Gamble Man. Ind. Timb. 490 Vern. *Dúdhi*, *Medhá-singhi*, Dún; *Karántá*, Hind.

A large climbing shrub with milky juice. *Leaves* 3-6 by 1-2.5 in., oblong or elliptic, acute or acuminate, coriaceous, glabrous and shining above, glaucous beneath; nerves many, slender, nearly horizontal, terminating in intramarginal veins; base acute; petiole 3-5 in. long. *Flowers* pale-white, in short peduncled, lax, dichotomous cymes. *Calyx* with 5 scales within short, acute. *Corolla* .6-.7 in. diam.; tube short, throat naked

lobes linear, twisted in bud. *Corona* of 5 fleshy clavate scales, included within the tube. *Stamens* free, included; filaments short, with a broad base; anthers sagittate, with a tuft of hairs at the back, tips acuminate, conniving. *Stigma* broadly conical. *Follicles* 2-4 by .5-.7 in., in divaricate pairs, narrow-lanceolate, straight, somewhat compressed; seeds compressed, oblong-ovate, with a tuft of hairs at the hilum which are about 1 in. long.

Common in the SIWALIK DIVISION, and also met with up to 4,000 ft. in the HILLS, e.g., Binalgadh, Thadiar, etc.

The milk of this climber quickly coagulates into a substance resembling caoutchouc and may be used for repairing punctures in bicycle tyres.

Fl. May, June. Fr. Cold season.

2. *Periploca*, Linn.

2. *P. calophylla*, Falc.; Fl. Br. Ind. iv. 12; Brandis For. Flora 330, Ind. Trees 467. Vern. *Párh*, Jaunsar.

A glabrous shrub with slender branches. *Leaves* about 3 by .5 in. or smaller, narrow-lanceolate, long-acuminate, coriaceous, shining; lateral nerves very numerous, parallel; petiole .2-.3 in. *Flowers* in lax cymes. *Calyx* glandular within; lobes ovate, obtuse. *Corolla* .3 in. diam., rotate, pinkish or pale-yellow; lobes ovate, longer than the tube, usually hairy on the upper surface, greenish below. *Corona* of 5 thick scales, connate into a 10-lobed ring, usually crowned with 5 filiform aristae. *Stamens* included, free; filaments short; anthers bearded at the back and cohering laterally; pollen granular. *Stigma* convex. *Follicles* about 6 by .3 in., in divaricate pairs, cylindrical; seeds linear, .5-.7 in. long; coma over 1 in. long.

In shady ravines in the OUTER HIMALAYA, e.g., Sansarú Khálá. Also in the TONS VALLEY, e.g., Khónigádh.

Fl. April, May. Fr. Cold season.

3. *Calotropis*, R. Br.

Erect shrubs with milky juice. *Leaves* usually sessile; rather fleshy. *Flowers* in umbelliform cymes. *Sepals* glandular within. *Corolla-tube* broad-campanulate; lobes ovate, valvate. *Corona* of 5 compressed fleshy appendages, adnate to and radiating

from the staminal column, spurred at the back. *Anthers* with a broad membranous tip, inflexed on the stigma; pollen-masses waxy, stipitate, pendulous. *Stigma* depressed, pentagonous. *Follicles* single, thick, straight on the ventral and convex on the dorsal side, very oblique and sharply incurved near the base; seeds with a silky coma.

Analysis of the Species.

Coronal scales truncate; flower-buds

ovoid; corolla-lobes spreading . . . 1. *C. gigantea*.

Coronal scales acute; flower-buds hemi-

spherical; corolla-lobes erect . . . 2. *C. procera*.

1. ***C. gigantea***, R. Br.; Fl. Br. Ind. iv. 17; Brandis For. Flora 331, Ind. Trees 471; Gamble Man. Ind. Timb. 491. Vern. *Madár, Safed Ák*, Hind.

A middle-sized shrub; young parts covered with adpressed white tomentum; bark pale. *Leaves* subsessile, 4-8 by 1-4 in., obovate or oblong, acute or acuminate, coriaceous, cottony beneath; base cordate. *Flowers* downy outside, on long pedicels arranged in axillary or subterminal pedunculate simple or compound umbels or corymbs; buds ovoid. *Corolla* dull-purple or white, .5-1 in. diam.; lobes ovate-lanceolate, spreading. *Corona-scales* elongated but truncate at the apex, hairy. *Follicles* 3-4 in. long, recurved; seeds ovate, .25 in. long, with a bright silky-white coma.

Believed to be found in the Dún and possibly also in the SAHÁRANPUR DISTRICT, but is certainly very rare in our area. There are no specimens in Herb. Dehra from this area.

The hair of the seeds makes a good stuffing material for pillows and cushions and mixed with a small proportion of ordinary cotton may be spun into thread. The fibre of the stems is used for bow-strings, fishing-lines and nets. The wood is made into gun-powder charcoal in the Deccan. The acrid juice and the roots are used in country medicine.

Fl. and fr. throughout the year.

2. ***C. procera***, R. Br.; Fl. Br. Ind. iv. 18; Brandis For. Flora 331, Ind. Trees 472, Gamble Man. Ind. Timb. 491. Vern. *Ák, Madár*, Hind.

Habit, leaves and inflorescence as of the preceding species, excepting that the leaves, 8-9 by 4 in., are more gradually narrowed and somewhat less cottony beneath when mature, and the peduncles rather longer. *Flowers* purplish-red, silvery outside, odorous; buds hemispherical. *Corolla-lobes* erect. *Corona-scales* acute, nearly as broad as long, glabrous or pubescent. *Follicles* as of the last species.

Economic uses, as of *C. gigantea*.

Common throughout the SAHÁRANPUR and DÚN DISTRICTS, generally in fallow lands and ráu-beds, e.g., Ránipur, Phándowála, etc. Also found in low valleys in the HILLS, e.g., Binalgádh, Silgádh, etc.

Fl. and fr. throughout the year, but chiefly in the cold season.

C. Acia, Ham.: Fl. Br. Ind. iv. 18,—occurs in grass-lands about Lachiwála in the Dún. It is an herbaceous plant with petiolate leaves, otherwise closely resembling *C. procera*.

4. *Holostemma*, R. Br.

H. Rheedianum, Spreng., Syn.—*H. Rheedei*, Wall; Fl. Br. Ind. iv. 21; Brandis Ind. Trees 468. Vern. *Rani Marwi*.

A glabrous climbing shrub, stems hollow, shining. *Leaves* opposite, 3-5 in. long by 2-3 in. broad, ovate, acuminate, membranous, deeply cordate with rounded basal lobes, upper surface nearly glabrous, lower finely pubescent especially on the nerves; basal nerves 5-7, midrib minutely glandular at the base; *petiole* 1-2.5 in. long, puberulous, narrowly winged. *Flowers* fragrant, in umbellate or sub-racemose pedunculate cymes, reddish-purple within, frosted-white or pale-pink outside; *peduncles* and *pedicels* 1-2 in. long. *Calyx* 5-partite; *lobes* ovate, puberulous, ciliate, .2 in. long. *Corolla* subrotate, 1-1.5 in. across, deeply 5-lobed; *lobes* thick, ovate-oblong, .5 in. long, overlapping to the right. *Corona* a fleshy ring, adnate to the base of the staminal column. *Filaments* connate; anther wings large, decurrent to the base of the column; *pollen masses* solitary in each cell, elongate, compressed, pendulous. *Follicles* 4-5 in. long, oblong, tapering to a blunt point. *Seeds* .25 in. long, thin, flattened; *coma* .75-1 in. long.

Fairly common in various parts of the Dún, i.e., Lachiwála; Mothronwála; Karwapani; Bharuwála; etc.

Fl. July-Sept. **Fr.** Dec.-Feb

5. *Gymnema*, R. Br.

1. *G. tingens*, W. & A.; Fl. Br. Ind. iv. 31; Brandis Ind. Trees 469.

A large twining shrub, almost wholly glabrous, old stems covered with reticulating ridges of white cork. *Leaves* 4-6 by 2-3-5 in., ovate, often cordate, membranous, acuminate or caudate; petiole 1-1-7 in. long. *Cymes* 4-6 in., corymbosely racemose; peduncle shorter than the petioles; bracts oblong. *Flowers* 3 in. diam., pale-yellow. *Sepals* glabrate. *Corolla-lobes* broadly ovate or oblong, glabrous. *Corona* of double villous processes inside the corolla-tube and below the sinuses. *Filaments* connate into a short column; anther-tips small membranous; pollen-masses one in each cell, waxy, stalked, erect. *Stigma* exerted. *Follicles* generally single, 3-5-4-5 by 7-1-2 in., uniformly tapering and acute at both ends, smooth and glabrous, slightly beaked. *Seeds* comose.

Nakraunda and Káluwála in the DŪN, not very common.

Fl. June-Aug. Fr. Nov.-Jan.

6. *Gongronema*, Dene.

1. *G. nepalense* Dene.; Fl. Br. Ind. iv. 33; Brandis Ind. Trees 471.

A large twining shrub: young shoots and inflorescence pubescent. *Leaves* 4-6 by 2-3-5 in., oblong elliptic or ovate, acuminate, membranous or subcoriaceous, glabrous above, puberulous along the nerves beneath; main lateral nerves about 8 pairs, arcuate, the lowest pair from near the base; base rounded, less frequently subcordate; petiole 8-1-7 in. long, rather slender. *Peduncles* 2-6 in. long, axillary, usually 1 to each pair of leaves, generally branching into 3 long divaricate umbel-bearing arms: pedicels 05-25 in., slender. *Flowers* yellow, 25 in. across. *Calyx* small, 5-partite. *Corolla* campanulate; tube and lobes of about the same length, the latter ovate, slightly overlapping to the right. *Coronal scales* generally absent. *Anther-tips* inflexed, concealing the stigma; pollen-masses solitary in each cell, waxy, erect. *Stigma* clavate or conical. *Follicles* 2-5-3 by 2-3 in., acuminate, thin-walled; seeds 3 in. long, linear; coma of very fine white silky hairs about 1 in. long.

Fairly common in the DŪN;—Lachiwála, Ráipur, Bindál nála, etc.

The strong fibre is used for the same purposes as that of *Marsdenia*.

Fl. Aug., Sept. Fr. Sept., Oct.

7. *Marsdenia*, R. Br.

Twining shrubs. *Leaves* more or less membranous, often cordate. *Flowers* (in the species described below)

in corymbosely branched compound cymes. *Calyx* 5-partite. *Corolla* usually campanulate, often with a brush of short hairs at the throat; lobes spreading, overlapping to the right. *Coronal scales* 5, erect, adnate to the back of the anthers. *Anthers* with an inflexed tip; pollen-masses waxy, stipitate, erect. *Stigma* truncate or beaked. *Follicles* usually in divaricate pairs, lanceolate; seeds comose.

Analysis of the Species.

- Coronal scales far exceeding the anther-tips; leaves cordate, velvety; follicles transversely rugose, beaked . . . 1. *M. Roylei*.
 Coronal scales not exceeding the anther-tips; leaves cordately 2-lobed, glabrescent; follicles longitudinally wrinkled, not beaked . . . 2. *M. tenacissima*.

1. ***M. Roylei***, Wight; Fl. Br. Ind. iv. 35: Brandis For. Flora 333, Ind. Trees 470; Gamble Man. Ind. Timb. 492. Vern. *Marua-bel*, Dún; *Kharchu*, Jaunsar.

A twining shrub; young parts soft-tomentose. *Leaves* 3-6 by 2-4.5 in., ovate, acuminate, often velvety beneath; base usually deeply cordate; petiole 1.5-2 in. *Cymes* 1-1.5 in. diam., much smaller and fewer-flowered than in *M. tenacissima*. *Flowers* somewhat larger. *Calyx* hairy outside. *Corolla-lobes* .15-.25 in. long, hirsute inside. *Follicles* 3 by 1-1.5 in., with a beak-like tip, transversely rugose; pericarp thick; seeds .5 in. long.

Outer slopes of the HIMALAYA; and also in JAUN SAR and TEHRIGARHWAL, up to 7,000 ft. Common at Mussoorie.

It yields a silky-white strong fibre which is used for fishing-lines and similar other purposes.

Fl. May, June. Fr. Cold season.

2. ***M. tenacissima***, W. & A.; Fl. Br. Ind. iv. 35: Brandis For. Flora 333, Ind. Trees 470; Gamble Man. Ind. Timb. 492 Vern. *Marua-bel*, Dún.

A large twining shrub; extremities soft-tomentose; bark grey, corky and deeply furrowed on old stems. *Leaves* 4-6 by 3-4 in., broad-ovate; cordately 2-lobed, acuminate, pubescent or tomentose when young; petiole 2-4 in. long. *Flowers* in corymbosely

branched cymes. *Corolla* .2 in. diam.; lobes oblong, ciliate. *Follicles* 4-6 by 1.2 in., lanceolate, finely pubescent, longitudinally wrinkled; pericarp very thick; seeds ovate-oblong, .5 in. long.

Occasionally in Khair forests of the DÚN and along the foot of the HIMALAYA. Less frequently in Sál areas.

The bark of young shoots yields a silky-white fibre of great strength, used for fishing-lines by the Goorkhas and for bow-strings by the "Mountaineers of Rajmahal."—*Sir D Brandis*. The coagulated milky juice can be used as India-rubber.

Fl. April, May. Fr. Cold season.

M. lucida, Edgew.; Fl. Br. Ind. iv. 36; Brandis For. Fl. 333, Ind. Trees 470. An evergreen climber. *Leaves* 4-5 in. long by 2-3 in. broad, elliptic, usually shortly acuminate, entire, rounded at the base, subcoriaceous, dark green and shining above, yellowish-green beneath; *petiole* 1-1.5 in. long. *Flowers* purple, fragrant, in dense corymbiform cymes; *peduncle* usually shorter than the petiole, rather stout, interpetiolar. *Corolla* glabrous outside, sparsely hairy within. *Follicles* about 5 in. long, lanceolate, smooth—has been collected at Kotikanasur, Chakrata Division. 7,000 ft. and may occur elsewhere also.

8. *Pergularia*, Linn.

1. *P. pallida*, W. & A.; Fl. Br. Ind. iv. 38; Brandis For. Flora 334, Ind. Trees 470; Gamble Man. Ind. Timb. 493.

A large twining shrub with corky bark on old stems; young parts pubescent with soft curved hairs. *Leaves* 2-4 by 1.2-3 in., ovate, cordate, acute or acuminate, entire, rather membranous, tomentose or pubescent beneath until mature; lateral nerves up to 6 pairs; *petiole* .8-1.3 in. long. *Cymes* very often interpetiolar. umbelliform, hairy; *peduncle* up to .5 in. long; *pedicels* .3-.7 in. long, slender, much crowded. *Flowers* .5-.7 in. across, yellowish-white, inodorous; buds oblong or oblanceolate. *Calyx* .15-.2 in. long, campanulate; segments subulate, ciliate at the edges. *Corolla-tube* as long as the calyx, somewhat swollen at the base; lobes linear, .2-.4 in. long, overlapping to the right. *Coronal scales* adnate to the back of the anthers, erect, flattened, acute, membranous; pollen-masses erect, waxy. *Follicles* 3-4 by 1 in., lanceolate, longitudinally wrinkled; seeds .4 in. long, broad-ovate, concave, comose.

Not uncommon in the DÚN, e.g., at Karwapáni and Lachiwála.

The fibre of young shoots may be found useful.

Fl. May-July. Fr. Sept.-Nov.

9. *Tylophora*, R. Br.

Twining perennial herbs or undershrubs, rarely erect. *Leaves* opposite. *Flowers* small, in simple or branched umbelliform or racemose cymes. *Calyx* 5-partite, segments ovate or lanceolate. *Corolla* rotate, deeply 5-lobed; lobes slightly overlapping to the right. *Corona* of 5 fleshy tubercles, adnate to the short staminal column. *Anthers* very small with membranous inflexed tips; *pollen masses* minute, 1 in each cell, globose or ovoid, erect or ascending, rarely horizontal. *Stigma* disciform, 5-angled. *Follicles* acuminate, usually slender, smooth. *Seeds* comose.

Analysis of the Species.

Calyx glabrous, coronal processes
gibbous 1. *T. himalaica*.

Calyx hairy.

Leaves 1.5-2.5 in. broad; flowers
white or pale green 2. *T. hirsuta*.

Leaves not more than .3 in. broad;
flowers dark purple 3. *T. tenerrima*.

1. *T. himalaica*, Hook. f.; Fl. Br. Ind. iv. 42.

A slender glabrous twining undershrub; *stem* finely striate. *Leaves* 1.5-3.5 in. long by .5-1 in. broad, ovate-lanceolate, acuminate, membranous, acute or rounded at the base; *petiole* .25-.5 in. long. *Flowers* deep reddish-purple, in distant umbels on a long slender rachis; *bracts* minute. *Calyx* glabrous; lobes lanceolate, ciliate on the edges. *Corolla* .3 in. diam., lobes thick, ovate-oblong, obtuse, minutely puberulous inside. *Coronal processes* gibbous. *Follicles* 4-5 in. long, lanceolate acuminate, finely striate. *Seeds* .3 in. long broadly ovate; *coma* 1 in. long.

Moist ravines near Dehra Dun; Sahansardhara.

Fl. Nov.

2. *T. hirsuta*, Wight; Fl. Br. Ind. iv. 43.

A dextrorse climber; *stems* densely tomentose. *Leaves* 2-4.5 in. long by 1.5-2.5 in. broad, ovate or ovate-lanceolate, acute

or acuminate, rounded or subcordate at the base, more or less hairy on both surfaces; *petiole* .5-1.5 in. long. *Flowers* .3-.4 in. diam. pale-green, in few-flowered, umbellate cymes. *Peduncles* villous, solitary, varying in length, often flexuous; *pedicels* filiform, up to .5 in. long. *Bracts* linear, about .1 in. long. *Calyx-segments* lanceolate, hirsute, about half the length of the corolla. *Corolla* .2-.3 in. diam., puberulous within, lobes ovate. *Coronal-processes* subglobose, wholly adnate to the staminal column. *Pollen masses* horizontal, very minute. *Follicles* 2-2.5 in. long, lanceolate, tapering gradually towards the apex, thin, glabrous, finely striate. *Seeds* .25 in. long, compressed; *coma* about 1 in. long.

Common in hedges in the Dun, i.e., Raipur; Lachiwala; Kowlagarh, Thanu; etc.

Fl. Aug.-Sept. Fr. Jan.

3. ***T. tenerrima***, Wight; Fl. Br. Ind. iv. 44.

A glabrous or sparsely pubescent slender perennial climber. *Leaves* 1-4 in. long by .1-.3 in. broad, linear or linear-lanceolate, acute or acuminate, membranous, rounded at the base, nerves usually obscure; *petiole* .2-.3 in. long. *Cymes* generally 4-flowered, on slender, filiform peduncles, often longer than the leaves; *pedicels* filiform, .25-.5 in. long. *Flowers* dark-purple. *Calyx* .5 in. long; *lobes* lanceolate, hispid. *Corolla* .3 in. diameter, dark purple; *lobes* linear-oblong, puberulous within. *Coronal-processes* with free, incurved, cuspidate tips. *Pollen masses* horizontal. *Fruit* not seen.

Mussoorie; Nalapani. Fl. July-Aug.

T. exilis, Coleb.; Fl. Br. Ind. iv. 44.

A slender climber with ovate-oblong or lanceolate, acuminate, glabrous leaves and long, slender, flexuous, simple or branched peduncles, bearing few-flowered sub-sessile umbels; *follicles* 3-5 in. long, long-pointed membranous, glabrous. It occurs in the Dun in shady localities, i.e., Mothronwala.

10. ***Heterostemma***, W. & A.

1. ***H. alatum***, Wight; Fl. Br. Ind. iv. 47; Brandis Ind. Trees 473.

A twining shrub; branches with two lines of grey hairs. *Leaves* 3-6 by 2-4 in., ovate elliptic or oblong, entire, acute or acuminate; nerves 3-4 pairs, winged beneath, the first two pairs sub-basal; base rounded or cuneate; *petiole* 1-2 in. long. *Flowers* yellow; about .5 in. diam., usually in racemose cymes; *peduncles* about .5 in. long, stout; *pedicels* .2-.5 in. long, slender. *Calyx* small

5-partite. *Corolla* rotate; lobes triangular, valvate. *Corona* of 5 large spreading horizontal lobes; pollen-masses minute, erect, waxy. *Stigma* truncate, 5-angled. *Follicles* double, divaricate through nearly three right angles and therefore pointing obliquely upward, 3.5 by 2.3 in., straight, pointed; pericarp thin; seed about .5 in. long, dark-brown, membranous; coma about 1 in. long, brownish-white.

Low valleys in JAUNSAAR and TEHRI-GARHWAL, up to 5,000 ft.; rather scarce; Thadiar.—*Mr. J. S. Gamble.*

Fl. Rainy season. Fr. Cold season.

11. *Dregea*, E. Meyer.

1. *D. volubilis*, Benth.; Fl. Br. Ind. iv. 46, Brandis Ind. Trees 468; Gamble Man. Ind. Timb. 493.

A stout twining shrub with a woody stem, and usually with rather stout and stiff branches; innovations generally hoary-tomentose. *Leaves* 3.5 by 2.3-5 in., ovate, entire, acute or acuminate, rather coriaceous, usually tomentose beneath when young; main lateral nerves up to 5 pairs; base rounded truncate or cuneate, less often cordate; petiole rather stout, .8-2 in. long. *Cymes* axillary or interpetiolar, umbelliform; peduncles 1-3 in. long, slender, drooping; pedicels .5-1.5 in., rusty-scaberulous. *Flowers* green, .3-.5 in. diam. *Calyx* about .1 in. across, stellate. *Corolla* dark-green, cup-shaped; lobes broadly triangular, overlapping to the right. *Coronal scales* 5, fleshy, hemispherical, adnate to the very short column, spreading, inner angle cuspidate; pollen-masses erect, waxy. *Stigma* dome-shaped. *Follicles* usually double, 3.4 by 1.1-2 in., lanceolate, longitudinally ribbed, velvety until mature, afterwards minutely tomentose; seeds 3.4 in. long, broad-elliptic, concave, shining, with sharp edges; coma of very fine white silky hairs about 1.5 in. long.

Very common in Khair forests in the DUN AND SAHARANPUR DIVISION, especially in the Jumna and Sông Valleys, up to 5,000 ft. Also in low valleys in JAUNSAAR, e.g., Kândâ, 4,500 ft.

Fl. April-June. Fr. Cold season.

12. *Hoya*, R. Br.

1. *H. longifolia*, Wall.; Fl. Br. Ind. iv. 56.

A glabrous shrub; stems slender rooting and climbing over trees and rocks. *Leaves* 2-5 in. long by .5-1 in. broad, narrow-lanceolate or oblanceolate, acuminate, thick, fleshy, nerves very obscure; petiole .3-.5 in. long. *Flowers* in axillary peduncled

umbellate cymes; *peduncle* .5-.15 in. long; *pedicels* .3-.75 in. long, glabrous; *bracts* minute. *Calyx* deeply 5-lobed; *lobes* ovate acute, glabrous. *Corolla* rotate, .5-.75 in. diam. fleshy, lobed half-way down; *lobes* 5, triangular, valvate. *Coronal-scales* 5, thick, fleshy, adnate to the staminal-tube, flattened, stellately spreading, inner angle of each process produced into a short spur, back rounded. *Staminal-column* short, filaments united; *anthers* with broad membranous tips, inflexed over the stigma; *pollen masse* solitary in each cell, waxy, erect; *Stigma* flat. *Follicles* 6-8 in. long, slender with thin pericarp, smooth.

Moist shady localities in the Dun; Mussoorie; near Rajpur; Sansaru Khala.

Fl. July-Aug.

13. *Leptadenia*, Br.

1. *L. reticulata*, Wight & Arn.: Fl. Br. Ind. iv. 63, Brandis Ind. Trees 472; Gamble Man. Ind. Timb. 493.

A diffuse twining shrub with corky bark on old stems; young parts hoary. *Leaves* 2-3 by 1-1.5 in., ovate oblong or elliptic, acute entire, coriaceous, pale glaucous beneath; lateral nerves 6-8 pairs but very faint; base rounded cuneate or acute, scarcely cordate; petiole .3-1.3 in. *Cymes* axillary, umbelliform, .5-1 in. diam., many-flowered; *peduncle* .3-6 in. long, rather stout; *pedicels* of varying lengths, but never exceeding the *peduncle*. *Flowers* dirty-or brownish-white, .2 in. diam. *Calyx* half the length of the flower; lobes acute or obtuse. *Corolla* rather fleshy; lobes pubescent, with margins folded inward, hooked and bearded at the tip, valvate in bud. *Corona* double—corolline of 5 scales between the corolla-lobes, staminal of an undulate ring at the base of the anthers. *Stigma* included, 5-angled. *Follicles* generally solitary by abortion, 2-3 by .5-.7 in., straight, turgid, very hard, smooth, with a thick curved beak; seeds .5 in. long, narrow-ovoid, flat, winged, comose at the hilum.

Along the foot of the SAHARANPUR SIWALIKS: Khárá, Bar-kálá, Ránipur, etc. Also grass lands near Mothronwála, DEHRA DŪN.

Fl. May-July. Fr. cold season.

14. *Orthanthera*, Wight.

1. *O. viminea*, Wight; Fl. Br. Ind. iv. 64; Brandis For. Flora 335, Ind. Trees 472; Gamble Man. Ind. Timb. 493. Vern. *Mahúr-gás*, *Khíp*, Hind.

A small erect twiggy leafless green shrub. *Flowers* about .2 in. long, dirty-brown, in few-flowered woolly cymes; *peduncles* .2-1 in. long. *Calyx* parted nearly to the base; *sepals* lanceolate, without glands. *Corolla* salver-shaped; tube cylindrical; lobes oblong, valvate in bud. *Corona* double, corolline of minute scales alternating with the corolla-lobes, staminal an undulating ring below the anthers; anthers without a tip; pollen-masses stipitate, erect. *Follicles* solitary, 4-6 in long, linear, compressed, erect; *pericarp* thin, brown inside; seeds .2 in. long, brown; coma of very fine silky hairs about .5 in. long.

Found in the ráu-beds of the SAHÁRANPUR FORESTS; also in the Sóng, Súswá and Ganges rivers in the DÛN.

The flower-buds are eaten as a vegetable in Oudh, and rope is made of the fibre.

Fl. Feb.-May. Fr. Sept.-Nov.

Asclepias curassavica, Linn.—An erect under-shrub about 2-3 ft. high with opposite, lanceolate or oblong-lanceolate, glabrous or slightly pubescent leaves 2-3.5 in. long and many-flowered umbels of orange-coloured flowers. *Corolla* about .3 in. diameter; lobes reflexed. *Corona* bright orange, of 5 erect spoon-shaped processes, adnate to the stipitate staminal column. *Follicles* solitary, erect 3 in. long. It is a native of West Indies but has become naturalised in many parts of Dehra Dun and Saharanpur Districts, chiefly along water-courses. Fl. Practically all the year round.

LVII. LOGANIACEÆ.

Trees, shrubs or herbs. *Leaves* opposite, simple, with interpetiolar stipules or a raised transverse line at the internodes. *Flowers* regular, in simple or compound axillary or terminal cymes. *Calyx* small, 4-5-toothed. *Corolla* 4-5-partite, imbricate or valvate. *Stamens* epipetalous, alternating with the corolla-lobes. *Ovary* free, 2-celled; ovules one or many in each cell; style simple; stigma simple or 2-lobed. *Fruit* a berry or a capsule, 1-many-seeded; albumen copious.

Analysis of the Genera.

Erect shrubs.	Cor. imbricate; fruit a capsule	a	1. BUDDLEIA.
Scandent shrubs.	Cor. valvate; fruit a berry	a	2. GARDNERIA.

1. **Buddleia**, Linn.

Trees, shrubs or herbs, usually mealy-or woolly-tomentose. *Leaves* united by a stipular line. *Flowers* tetramerous. *Corolla-lobes* imbricate in bud. *Stamens* 4; filaments very short. *Style* linear; ovules many in each cell; stigma obscurely 2-lobed. *Capsule* septidally 2-valved; seeds small, many.

Analysis of the Species.

Flowers in interrupted panicles of heads; leaves broad and tomentose on both surfaces	1. <i>B. paniculata</i> .
Flowers in panicles of dense spikes; leaves narrow and glabrous above	2. <i>B. asiatica</i> .

1. **B. paniculata**, Wall.; Fl. Br. Ind. iv. 81; Brandis For. Flora 318, Ind. Trees 475; Gamble Man. Ind. Timb. 495. Vern. *Sendroi*, Jaunsar.

An evergreen shrub with a crooked stem; bark thin, light grey, peeling off in long strips; extremities rusty-tomentose. *Leaves* 4-6 by 2 in., variable from lanceolate to ovate-triangular, dentate crenate or sub-entire; petiole .5-1.5 in. *Flowers* fragrant, subsessile in pedunculate heads or clusters forming an irregular panicle. *Calyx* .15-.2 in., urceolate, woolly outside; teeth short. *Corolla* pink and white, tomentose outside, tubular; lobes rounded, obtuse. ellipsoid, .2 in. long.

Fairly common in JAUN SAR and TEHRI-GARHWAL, 4,000-7,500 ft., especially on exposed sunny slopes; e.g., Deoban, along the Lower Chakrata road; Luhásu Block, Lambátách; etc.

Wood moderately hard and close-grained, weighing 41 lbs. per c. ft., but is used only as fuel. Likely to be useful in re-stocking bare hillsides.

Fl. April, May.

2. ***B. asiatica***, Lour.; Fl. Br. Ind. iv. 82; Brandis For Flora 318, Ind. Trees 475; Gamble Man. Ind. Timb. 495. Vern. *Dúdhia*, Dún.

A large evergreen shrub; bark thin, grey; extremities densely clothed with soft grey tomentum. *Leaves* 4-6 by 1-1.3 in., lanceolate, serrulate, glabrous and dark-green above, densely grey or white-tomentose beneath; petiole .2 in. or 0. *Flowers* odorous sessile, in dense bracteate spikes arranged in large leafy terminal panicles. *Calyx* .15-.2 in., campanulate; teeth triangular. *Corolla-tube* urceolate; lobes short, rounded, imbricate, at first white but fading into deep purple. *Capsule* .2-.3 in. long, ellipsoid; valves bifid.

Common in ravines and grass lands in the SIWALIK DIVISION, and is often planted in gardens for ornament.

Wood tough and moderately hard. The branches would probably make good walking-sticks. Weight 44 lbs. per c. ft.

Fl. Mar., April.

2. ***Gardneria***, Wall.

1. ***G. angustifolia*** Wall.; Fl. Br. Ind. iv. 93; Brandis Ind. Trees 477; Gamble Man. Ind. Timb. 499.

A large scandent glabrous shrub. *Leaves* opposite, 3-4 by 1 in., lanceolate, acuminate, entire, glabrous, rounded or acute at the base; petiole .2-.3 long. *Flowers* about .5 in. across, solitary, on nodding filiform axillary peduncles .4-1 in. long. *Calyx* small, deeply 4-5-lobed. *Corolla* rotate; lobes .2 in. long, thick, valvate in bud. *Stamens* 4-5, on the corolla-tube; anthers subsessile; cells ovate, subconnate. *Ovary* 2-celled; ovule 1 in each cell; style cylindrical; stigma 2-lobed. *Fruit* a scarlet berry, .3 in. diam.

Found at Mussoorie and in the Bear Garden below Chakrata. Very scarce.

Fl. June, July.

Order 7.—POLEMONIALES.

LVIII. BORAGINACEÆ.

Herbs, shrubs or trees. *Leaves* simple, alternate rarely subopposite or opposite. *Flowers* in simple or

compound usually-terminal cymes, rarely solitary or axillary. *Calyx* persistent; lobes usually 5, valvate in bud. *Corolla* hypogynous, gamopetalous, often with scales in the throat; segments as many as those of the calyx, generally imbricate in bud. *Stamens* epipetalous, alternating with the corolla-lobes. *Ovary* superior, of two carpels, entire or 4-lobed; cells usually 2-ovuled; style simple or forked, terminal or gynobasic (from between the lobes of the ovary). *Fruit* a drupe with 1-4 kernels, or separating into 2-4 nutlets; seeds erect or oblique.

Analysis of the Genera.

- | | |
|--|-------------|
| Style twice forked; fruit at least .5 in.
diam., usually 1-celled, 1-seeded | 1. CORDIA. |
| Style 2-fid; fruit up to .2 in. diam., with
1-4 kernels | 2. EHRETIA. |

1. **Cordia**, Linn.

Trees or shrubs. *Leaves* alternate, rarely sub-opposite, petioled, usually coriaceous. *Flowers* often polygamous, in terminal or leaf-opposed cymes. *Calyx* 4-5-toothed; teeth accrescent in fruit. *Corolla* funnel-shaped; lobes 4-8. *Stamens* 4-8; filaments hairy. *Ovary* entire, 4-celled, 1 ovule in each cell; style twice bipartite, terminal. *Drupe* ovoid; endocarp hard, usually 1-celled by abortion; albumen 0.

Analysis of the Species.

- | | |
|--|------------------------|
| Leaves broad-ovate, glabrescent; calyx
not ribbed | 1. <i>C. obliqua</i> . |
| Leaves rotundate, scabrous above, tomentose
beneath; calyx ribbed | 2. <i>C. vestita</i> . |

1. **C. obliqua**, Willd.; Syn.—*C. Myxa* (not of Linn.); Fl. Br. Ind. iv. 136 excl. var.; Brandis For. Flora 336, Ind. Trees 478; Gamble Man. Ind. Timb. 500. Vern. *Lassorá, Lassúrá, Lessorá, Hind.*

A middle-sized deciduous tree, usually with a long bole; bark grey or brown, with shallow longitudinal wrinkles. *Leaves* variable, 3-6 by 2-4 in., broad-ovate, crenate or wavy at the margins, coriaceous, obscurely hairy beneath when young, from slightly scabrous to glabrous above; base rounded or cuneate; lateral nerves 4-6 pairs, the first pair sub-basal; petiole .5-2 in. *Flowers* white, polygamous, usually pentamerous, in loose ebracteate corymbose cymes. *Calyx* 1-1.5 in., irregularly toothed, not ribbed, accrescent in fruit. *Corolla-lobes* 1-1.2 in.; tube hairy within. *Drupe* yellow and glossy when ripe, usually 1-seeded, filled with a viscid sweetish pulp.

Common in the DÚN and SAHÁRANPUR FORESTS, affecting shady ravines. Also Tons and other low Valleys in JAUNSAIR and TEHRI-GARHWAL.

Wood soft and porous, but seasons well and is fairly strong, used chiefly for fuel; weight 33 lbs per c. ft. The fibre of the bark is made into ropes and is used to caulk boats. The fruit is eaten, both tender and ripe. The viscid pulp of the ripe fruit is used as bird-lime. The leaves are often used as plates.

Fl. Mar., April. Fr. May-July.

According to Hutchinson in Kew Bull. 1918, *C. Myxa*, L. is the tree of Asia Minor, Palestine and North Africa. It has short expanded style-arms, while in the Indian tree the style-arms are more slender.

2. **C. vestita**, Hook. f. & Th.; Fl. Br. Ind. iv. 139; Brandis For. Flora 338, Ind. Trees 480; Gamble Man. Ind. Timb. 502. Vern. *Barolá Bairolá*, E. Dún and Garhwal; *Kúm, Saháranpur. Kúm-paiman*, Hind.

A small deciduous tree with a low rounded crown; bark greenish-grey, smooth, exfoliating in large woody scales; young parts covered with grey pubescence. *Leaves* 3-6 by 2.5-5 in., broad-elliptic or orbicular, acuminate, coriaceous, scabrous above, tomentose beneath until mature; lateral nerves 3-5 pairs, the lowest sub-basal; base cuneate, rounded or shallow-cordate; petiole 1-1.5 in. *Flowers* yellowish-white, polygamous, in dense compound cymes. *Calyx* .5 in. long, more or less ribbed outside. *Corolla-lobes* .3 in., ovate-oblong, spreading; tube as long as the lobes. *Drupe* .7 in. long, supported by the accrescent saucer-shaped calyx, and cuspidate with the remains of the style, filled inside with a gelatinous pulp.

Fairly common in the SAHÁRANPUR SIWALIKS and only occasionally met with in the DÚN, e.g., Tháno, Phándowála, Timli, Tirsál, etc. Also Kálsi.

Heartwood light-brown, beautifully mottled with darker veins, even-grained, hard, strong, tough and elastic, and is employed, where known, for wheel and well-work; weight 52-53 lbs. per c. ft. The pulp of the fruit is eaten.

Fl. and young leaves Mar., April. Fr. Oct., Nov.

2. *Ehretia*, Linn.

Trees or shrubs. *Leaves* alternate, entire or toothed. *Flowers* small, in axillary or terminal corymbs or panicles. *Calyx* deeply 5-partite. *Corolla* rotate; lobes 5, imbricate in bud. *Stamens* 5; anthers generally exserted. *Ovary* 2-celled; cells 2-ovuled; style terminal, bifid. *Fruit* a sub-globose drupe with 1-4 pyrenes; pyrenes solitary and 4-celled, or 2 and 2-celled, or 4 and 1-celled; cells 1-seeded; albumen scanty.

Analysis of the Species.

Leaves serrate; flowers in terminal panicles	1. <i>E. acuminata</i> .
Leaves entire; flowers in terminal and axillary dichotomously compound corymbose cymes	2. <i>E. laevis</i> .

1. *E. acuminata*, R. Br.; Fl. Br. Ind. iv. 141; Brandis Ind. Trees 481; Gamble Man. Ind. Timb. 503. Syn.—*E. serrata*, Roxb.. Brandis For. Flora 339. Vern. *Pandáyan*, Dún; *Púna*. Jaunsar and Hind.

A middle-sized tree nearly glabrous; large stems more or less fluted; bark brown, or when old mostly dark-grey, with longitudinal furrows or cracks. *Leaves* 4-8 by 1.5-3 in., elliptic-oblong, acuminate, sharply serrate, glabrescent and shining above, tough but rather thin; lateral nerves 8-10 on either side; petiole .5-1 in. *Flowers* numerous, white, fragrant, in large conical terminal panicles. *Corolla-lobes* .12 in., reflexed. *Style* bifid for less than half its length. *Drupe* .12-.16 in. diam., with two 2-celled and 2-seeded pyrenes.

Fairly common in grass-lands in the WESTERN DÚN, and also found at Kálsi and lower valleys in JAUNSAK up to 5,000 ft.: Binál-gádh, Silgádh, Thadiár, etc. Also at Káluwála, Nakraunda, Gulá-tappar, etc., in the E. DÚN.

Wood light-brown, soft, light, fairly compact, easily worked; used for agricultural implements, scabbards, sword-hilts, etc.; weight 37 lbs. per c. ft. The fruit is eaten and the leaves are lopped for cattle-fodder.

Fl. Mar., April. Fr. Nov., Dec.

2. *E. laevis*, Roxb.; Fl. Br. Ind. iv. 141; Brandis For. Flora 340, Ind. Trees 481; Gamble Man. Ind. Timb. 503. Vern. *Chamrót*, Hind.

A moderate-sized deciduous tree with an irregular-shaped trunk, and a spreading crown; bark smooth, mealy-grey outside, inner substance yellow, soft, not fibrous. *Leaves* 3-6 in. long, elliptic, obtuse or acuminate, entire, membranous while young, hard and fleshy when mature, glabrous or glabrescent, dark green; nerves 6-10 on either side of the midrib; base cuneate, rarely rounded; petiole .5-1 in. *Flowers* white, small, in terminal or axillary dichotomously-branched corymbose cymes. *Corolla-tube* 1 in.; lobes .12 in., spreading. *Drupe* .2 in. diam., globose, depressed, 4-ribbed, with 1-4 one-seeded pyrenes.

Exceedingly common in the DÚN and SARÁRANPUR FORESTS, generally in damp shady places, e.g., Lachiwála Coppice, Kánsráo Pass, etc. Also in the Ámláwa and Tons Valleys in JAUNSAK.

Wood tough and fairly durable, and is sometimes used for agricultural implements, but in this part of the country chiefly as fuel; weight 33-38 lbs. per c. ft.

Fl. Mar., April. Fr. Cold season.

LIX. CONVULVULACEÆ.

Herbs or shrubs, usually twining, often with milky juice. *Leaves* alternate, simple, exstipulate. *Flowers* regular, bisexual, pentamerous, often showy. *Calyx* persistent, deeply 5-lobed; lobes imbricate, sometimes enlarged in fruit. *Corolla* campanulate or funnel-shaped often 5-plaited in bud. *Stamens* 5; anthers oblong.

Ovary superior, 2-carpelled and 2-celled, or by false dissepiments 4-celled; ovules 2 in each carpel. *Style* 1, rarely 2; stigma 2-lobed or branched. *Fruit* indehiscent, often breaking up irregularly; albumen 0 or scanty; cotyledons generally plaited (0 in *Uscuta*).

Analysis of the Genera.

- Fruit indehiscent, coriaceous or fleshy.
 - Stigmas 2, linear-oblong 2. RIVEA.
 - Stigmas 2, globose.
 - Ovary 4-celled 3. ARGYREIA.
 - Ovary 2-celled 4. LETTSOMIA.
- Fruit dehiscent, style undivided.
 - Sepals enlarging into wings in fruit; capsule
 - 1-seeded 1. PORANA.
 - Sepals sometimes slightly accrescent but not wing-like in fruit; capsule usually more than 1-seeded 5. IPOMÆA.

1. **Porana**, Burm.

Climbing shrubs. *Leaves* alternate, entire, petioled. *Flowers* in racemes, often much paniced; *bracts* persistent. *Sepals* 5, small, narrow when in flower, the 3 outer or all much enlarged, membranous and nerved when in fruit. *Corolla* campanulate or funnel-shaped, usually small; *limb* plicate, subentire or lobed. *Stamens* 5, usually included. *Ovary* 1 or 2-celled; *ovules* 2 or 4; *style* slender, with a single 2-lobed or 2-capitate stigma. *Fruit* small, subglobose membranous capsule, indehiscent or 2 valved. *Seed* 1, glabrous.

Analysis of the Species.

- Flowers in long pendulous panicles, 3 of the sepals enlarged in fruit; limb of corolla shortly lobed 1. *P. paniculata*.
- Flowers in dichotomous racemes, all the sepals enlarged in fruit, limb of corolla deeply lobed 2. *P. racemosa*.

1. **P. paniculata**, Roxb.; Fl. Br. Ind. iv. 222; Brandis For. Flora 342, Ind. Trees 487; Gamble Man. Ind. Timb. 507. Vern. *Bel Kāmū*, *Safed-bel*, Sahāranpur; Bridal Wreath.

A large twining shrub; branchlets, inflorescence and under-side of leaves clothed with grey pubescence. *Leaves* very variable in size, 2·5 by 1·5-3 in. (those running into the inflorescence much smaller), ovate-cordate, acuminate, entire, membranous, pubescent, with 5-7 basal nerves; petiole 1-5 in. long. *Flowers* very numerous, small, white, in large axillary and terminal leaf-bearing panicles. *Sepals* in flowers ·1 in. long, linear-oblong, 3 enlarged in fruit into ovate-oblong membranous strongly reticulate shortly-stalked wings, ·6-9 in. long, with a prominent midrib. *Corolla* ·2 in. long; limb shortly lobed. *Filaments* short. *Ovary* 2-celled, 4-ovuled; style short; stigma obscurely 2-lobed. *Capsule* ·25 in. diam., globose, hairy, membranous, fragile, 1-seeded by abortion; seed glabrous.

Very common in the DŪN and SAHĀRANPUR FORESTS, generally in scrub jungles.

This climber is largely used in the Sahāranpur District for making into baskets, and is generally preferred to all other plants used for the same purpose. The baskets used in removing earth while the Ganges Canal was being excavated are said to have been chiefly made of this climber.

Fl. Oct.-Jan. Fr. Mar., April.

2. **P. racemosa**, Roxb.; Fl. Br. Ind. iv. 222; Brandis Ind. Trees 487; Gamble Man. Ind. Timb. 507; The Snow Creeper.

A climbing herb, stems puberulous or nearly glabrous. *Leaves* 2-4 in. long by 1·5-2·75 in. broad, broadly ovate, acuminate, deeply cordate at the base, thin, membranous; *petiole* slender, 1·25-2·5 in. long. *Flowers* white, pedicelled, in lax dichotomous racemes much longer than the leaves; *bracts* at the forks amplexicaul, persistent, leafy, those on the pedicels linear. *Sepals* 5 (in flower) ·12 in. long, linear-oblong, puberulous, all enlarging in fruit with 3-5 strong longitudinal nerves. *Corolla* subcampanulate, nearly ·4 in. long, lobed nearly half-way down; *lobes* oblong. *Capsule* ·2 in. long, subglobose, apiculate, membranous, glabrous.

Ravines near Dehra; Robber's cave; Mussoorie and Tehri Garhwal.

Fl. Oct.,-Nov.

2. *Rivea*. Choisy.

1. **R. ornata**, Choisy, var. *Griffithii*, Clarke; Fl. Br. Ind. iv. 183; Syn.—*R. Roxburghii*, Prain.; Brandis Ind. Trees 484; *Argyreia ornata*, Sweet; Brandis For. Flora 343.

A stout erect shrub or undershrub 3-5 ft. high. *Leaves* 3-7 in. diameter, usually broader than long, orbicular-cordate or reniform, obtuse or often very shortly apiculate at the apex, grey-silky beneath; *petioles* about as long as the leaves, with a greenish gland on either side at the apex. *Peduncles* axillary, about as long as the *petioles*, 5-7-flowered; *bracts* lanceolate. *Flowers* white, fragrant. *Sepals* 5, subequal, .5-.75 in. long, thick, ovate-lanceolate, acute, persistent, silky hairy outside. *Corolla* salver-shaped, glabrous outside; *tube* 1.75—2.25 in. long; *limb* 2-3 in. diameter. *Stamens* 5, included; *anthers* narrow, oblong. *Ovary* 4-celled; *ovules* 4; *style* filiform; *stigmas* 2, linear-oblong. *Fruit* subglobose .7 in. diameter, yellowish-brown, usually supported by the persistent calyx at the base, breaking up irregularly.

Bindal nala near Dehra; Siwaliks near Asarori; Ramgarh; etc.

Fl. Aug.-Sept. Fr. Oct., Nov.

3. *Argyreia*, Lour.

1 *A. Roxburghii*, Choisy.; Fl. Br. Ind. iv. 185; Brandis Ind. Trees 485.

A robust twiner; stems hairy. *Leaves* 3-7 in. diam. broadly ovate, or orbicular-cordate, shortly acuminate, softly hairy on both surfaces; *petiole* 1.5-4 in. long. *Peduncles* axillary 2-3.5 in. long; *bracts* sub-persistent, narrow, elliptic, sometimes foliaceous, densely hairy. *Sepals* 5, leathery, .3-.5 in. long. *Corolla* 2.5 in. long, funnel-shaped, red; limb plicate with a few adpressed hairs on the bands. *Stamens* 5, included; *filaments* wider at the base. *Ovary* 4-celled; *ovules* 4; *style* filiform; *stigmas* 2, globose. *Fruit* depressed globose, fleshy, orange, .75-1 in. diameter.

Run wild near Dehra, i.e., Rajpur; Birpur; behind Viceroy's Bodyguard lines, etc.

Fl. Aug., Sept.

A. speciosa Sweet; Fl. Br. Ind. iv. 185. Brandis Ind. Trees 485. The Elephant creeper.

A large climbing shrub with stout white-tomentose stems. *Leaves* 4-12 in. long, ovate, cordate, acute, glabrous above and persistently white-tomentose beneath; *petiole* 1-9 in. long. *Flowers* purple, in corymbose many-flowered cymes on peduncles 3-8 in. long; *bracts* large, foliaceous, ovate acuminate, deciduous. *Sepals* 5, white tomentose. *Corolla* about 2.5 in. long, tubular-funnel shaped, white-woolly outside, bright-purple within; *limb* 2 in-

diameter. Cultivated in gardens and occasionally met with as an escape.

Fl. Aug.-Oct.

4. *Lettsomia*, Roxb.

L. Thomsoni, Clarke; Fl. Br. Ind. iv. 193. Brandis Ind. Trees. 486.

A large pubescent climber with milky juice. *Leaves* 3-5 in. long by 2-4 in. broad, ovate, cordate, acuminate, sparsely strigose on both sides, lateral nerves about 15 pairs; *petiole* up to 2·5 in. long. *Flowers* in axillary, peduncled, usually 1-3-flowered heads; *peduncle* 2-5 in. long, pubescent. *Bracts* 3-5 in. long, spatulate-oblong, sparsely villous, deciduous or sub-persistent. *Sepals* 5, slightly longer than the bracts, ovate, acute, densely clothed with soft grey or fulvous hairs, coriaceous and somewhat enlarged in fruit. *Corolla* funnel-shaped, 2 in. long, rose-purple, hairy outside; limb plicate; lobes shallow. *Stamens* 5; *anthers* included. *Ovary* 2-celled, 4-ovuled. *Style* filiform; *stigmas* 2, globose. *Fruit* dry indehiscent 2-4 seeded, red, 3-4 in. diameter.

Siwalik Range, 2,500 ft. and rocky ground near Dehra, i.e., Timli Pass; above Mohand; Birpur; Barkala, etc.

Fl. Aug.-Oct.

5. *Ipomæa*. Linn.

Twining herbs, rarely shrubs. *Leaves* alternate, entire, lobed or divided. *Flowers* axillary, solitary or in cymes. *Sepals* 5, equal or unequal, ovate or linear often enlarged in fruit. *Corolla* campanulate or funnel-shaped; limb plicate, very shortly lobed. *Stamens* 5, unequal; *filaments* often hairy at the base; *anthers* oblong often twisted. *Ovary* usually 2-rarely 3-or 4-celled; *ovules* usually 4, rarely 6. *Disc* annular; *style* filiform; *stigma* entire or 2-globose. *Capsule* 3-4-valved; *seeds* usually 4 or 6, glabrous or tomentose.

I. Turpethum, R. Br.; Fl. Br. Ind. iv. 212. Brandis Ind. Trees 488. Vern. *Nishoth*, Hind.; *Trivrit*, *Kalaparni*, Sans.

A perennial climber; stems with milky juice, much twisted together, angular, winged, brown when old. *Leaves* 2-5 in. long by 1-4 in. broad, broadly-ovate or ovate-lanceolate, subacute, mucronate, base cordate or truncate, shortly pubescent on both surfaces, specially when young; *petiole* .75-2 in. long, pubescent. *Cymes* 3-5-flowered; *peduncle* stout, 1-2.5 in. long, pubescent; *bracts* oblong, pubescent, cuspidate, often reddish, 1 in. long, deciduous, *Sepals* 5, ovate-oblong or broadly elliptic, .5-.75 in. long, the outer 2 herbaceous, nearly orbicular, the 3 inner membranous, all enlarged and thickened in fruit, at length splitting irregularly. *Corolla* white, tubular-campanulate, 1.5-2 in. long. *Capsule* .5-.75 in. diameter, globose, enclosed in the enlarged imbricate calyx-segments. *Seeds* round, black.

Dehra Dun near villages, Doiwala; Jhajra, etc. The root known as Indian jalap or Turpeth-root is largely used as a purgative.

Fl. Nov.-Jan.

The following species of *Ipomæa* also deserve mention.

1. *I. muricata*, Jacq.; Fl. Br. Ind. iv. 197.—A herbaceous climber with muricate stems and ovate-cordate, entire, acuminate leaves 3-6 in. long. *Flowers* rose-purple on 1-5-flowered peduncles variable in length; *pedicels* thickened upwards in fruit. Common near villages; Lachiwala; Raipur, etc.

Fl. Sept.-Nov.

2. *I. hederacea*, Jacq.; Fl. Br. Ind. iv. 199.—A slender climber with retrorsely hairy stems and ovate-cordate, more or less 3-lobed leaves. *Flowers* blue or tinged with pink on 1-5-flowered peduncles and long narrow sepals with ligulate tips. *Corolla* 1.5-2 in. long. Probably introduced and run wild all over the area near villages. The seeds known as *Kaladana* are used as a purgative.

Fl. Sept.-Nov.

3. *I. pes-tigridis*, Linn.; Fl. Br. Ind. iv. 204.—A hairy climber with deeply palmately 5-9-lobed leaves 1.5-4 in. diameter. *Flowers* sessile, 3 or more together in peduncled heads, surrounded by large, persistent, outer hairy bracts. *Corolla* about 1 in. long, tubular-campanulate, white or pale-pink. Common within the area, climbing on hedges and bushes.

Fl. Sept.-Nov.

4. *I. hispida*, Roem. & Sch.; Syn. *I. eriocarpa*, R. Br.; Fl. Br. Ind. iv. 204.—A slender villous climber with ovate-oblong, entire, acute, cordate leaves hairy on both surfaces, 1.5-3 in. long

Flowers pink in axillary subsessile heads. *Corolla* campanulate, about .5 in. long.

Common within the area.

Fl. Sept., Oct.

5. *I. pilosa*, Sweet; Fl. Br. Ind. iv. 213.—An annual climber with softly hirsute stems and broadly ovate-cordate, acute or acuminate leaves, hairy above, white-woolly beneath, 2.5 in. long and about as broad as long. *Flowers* purple, in lax racemose bracteate cymes. *Corolla* narrowly funnel-shaped, about .75 in. long.

Common in Dehra and Saharanpur Districts.

Fl. Oct., Nov.

6. *I. Batatas*, Lamk.; Fl. Br. Ind. iv. 202. Vern. *Shakarkand*. The Sweet potato.—A prostrate plant with milky juice and triangular or ovate, usually irregularly lobed leaves with more or less cordate base; roots tuberous. *Flowers* purple, 2-several on long axillary peduncles with short pedicels. Cultivated both in Dehra and Saharanpur Districts for the sake of its root tubers. It is believed to be a native of Tropical America.

7. *I. sinuata*, Ortega; Fl. Br. Ind. iv. 214.—An extensive hairy climber with palmately 5-7-partite, nearly glabrous leaves, about 3 in. diameter; lobes toothed or subpinnatifid. *Flowers* white or pinkish with the throat purple, on 1-flowered axillary peduncles. *Corolla* narrowly campanulate, about 1.5 in. long. Cultivated in gardens. It is a native of Tropical America.

Fl. Nov.

8. *I. palmata*, Forsk.; Fl. Br. Ind. iv. 210. The Railway creeper.—A perennial glabrous climber, stems somewhat rough when old. *Leaves* 1.2 in. long and about as broad, palmately cut almost to the base into 5 oblanceolate, obtuse, mucronate glabrous segments. *Flowers* usually 1.3 on axillary peduncles. *Corolla* widely campanulate 1.5-2 in. long, dull violet with a purple tube.

Common in gardens and in hedges, flowering most part of the year. It is probably indigenous to the Western Peninsula.

9. *I. purpurea*, Roth.; Fl. Br. Ind. iv. 200. The morning glory.—A hairy climber with entire, ovate cordate, shortly acuminate, pubescent leaves and showy flowers about 2 in. long with deflexed pedicels, varying in colour from white to pale-blue or purple. It resembles *I. hederacea* at first sight but can always be distinguished from it by its smaller and entire leaves and by the sepals not having ligulate tips. It is native of Tropical America but has now become naturalised near Dehra.

Fl. Aug.-Oct.

10. *I. Bona-nox*, Linn.; Fl. Br. Ind. iv. 197; Brandis Ind. Trees, 487; The moon-flower. A large climber with milky juice and often muricate stems. *Leaves* 3-7 in. long, broadly ovate, acuminate, entire, thin, deeply cordate; *petioles* about as long as the leaves. *Flowers* fragrant, 1-5 on peduncles 2-6 in. long. *Corolla* salver-shaped, white with greenish plaits.

Run wild in ravines near Dehra. The flowers open in the evening and close the next morning.

Fl. Oct., Nov.

11. *I. rubro-cœrulea*, Hook. An annual climber with ovate, cordate, entire, acuminate, cuspidate, glabrous leaves 2-4 in. long. *Flowers* large, handsome, blue or white.

Cultivated in gardens. It is a native of Mexico.

Fl. Oct., Nov.

12. *Cuscuta reflexa*, Roxb.; Fl. Br. Ind. 225. The Dodder. Vern. *Akās-bel*, Hind; *Sarag-bāli*, Jaunsar;—is the well-known leafless greenish-white or yellow flowering parasite, very common in the scrub forests along the outer foot of the SIWALIKS and in similar localities in the DUN, chiefly affecting all species of *Zizyphus* and also *Adhatoda Vasica*. The leafless character is carried even to the embryo which is destitute of cotyledons. The seed germinates on the ground, but the plant does not seem to derive much nourishment from it, its growth being sustained, for the little while it is obliged to shift for itself, by the fleshy albumen in which the germ-plant is imbedded in the seed. As soon as the seedling twines itself round a woody plant, it develops several thick sucker-like haustoria along the surface of contact, which, penetrating the bark of the host, begin to draw nourishment from the cambium-layer. Directly this is effected, it loses its attachment to the soil, and the portion of it below the lowest haustorium then dries and drops off. Henceforth the parasite goes on flourishing entirely at the expense of the host. It is used in veterinary practice for poultice on sprains.

Fl. Sept.-Feb. Fr. Feb.-April.

LX. SOLANACEÆ.

Herbs or shrubs, rarely soft-wooded small trees. *Leaves* alternate, exstipulate. *Flowers* solitary or in clusters or cymes, axillary, extra-axillary or terminal,

regular, bisexual, usually pentamerous. *Calyx* inferior, free, usually persistent, sometimes enlarged in fruit. *Corolla* gamopetalous, rotate or campanulate, often plaited; limb 5- or more-lobed or entire. *Stamens* 5, epipetalous. *Ovary* superior, usually 2-celled; ovules many, on peltate placentas; style simple. *Fruit* a many-seeded berry or capsule; seeds generally compressed.

Analysis of Genera.

Fruit indehiscent, a berry

 Anthers connivent in a cone, calyx not
 accrescent 1. SOLANUM.

 Anthers not connivent in a cone; calyx
 accrescent 2. WITHANIA.⁴

Fruit Capsular 3. DATURA.

1. *Solanum*, Linn.

Herbs or shrubs, sometimes scandent, rarely small trees, unarmed or prickly. *Leaves* alternate or sub-opposite, entire, lobed or pinnatifid. *Flowers* in dichotomous or racemose lateral or terminal cymes. *Calyx* 5-10-lobed, rarely subentire, usually not accrescent in fruit. *Corolla* rotate, or widely campanulate; limb plicate, usually 5-lobed. *Stamens* usually 5, attached to the corolla throat; *filaments* short; *anthers* connivent in a cone, opening by terminal pores or short slits. *Ovary* 2-celled, rarely 3-4 celled; *style* columnar, *stigma* small. *Fruit* a globose or elongated berry. Seeds numerous, small, usually discoid.

Analysis of the species.

- Unarmed shrub, woolly-tomentose . . . 1. *S. verbascifolium*.
 Armed shrubs or undershrubs; flowers
 mostly under 1 in. diam.; berry .3-.5 in.
 Leaves with prickles, calyx usually
 prickly; flowers blue . . . 2. *S. indicum*.
 Leaves unarmed or with only 1 or 2
 prickles beneath, calyx unarmed;
 flowers white . . . 3. *S. torvum*.

1. ***S. verbascifolium***, Linn.; Fl. Br. Ind. iv. 230; Gamble Man. Ind. Timb. 508. Brandis Ind. Trees 489. Vern. *Ban Tamákú*, Dún; *Asedú*, Garhwal.

A tall soft-wooded shrub, unarmed; bark light-grey; extremities and inflorescence stellate-woolly. *Leaves* alternate or falsely sub-opposite, 7-9 by 3-5 in., elliptic, acute at both ends or often rounded at the base, entire, subcoriaceous, stellately woolly, giving a fetid smell when bruised; petiole 1-2 in. *Flowers* in very woolly dichotomous cymes. *Calyx-lobes* enlarged in, but much shorter than, the fruit. *Corolla* .7 in. diam., white, woolly outside; limb plaited in bud. *Stamens* 5, on the corolla-throat; anthers apiculate and joined into a cone round the style, opening by terminal pores. *Ovary* usually 2-celled. *Berry* .3-.5 in. diam., yellow when ripe.

Fairly common in moist shady places in the Dún (e.g., banks of the Song river), and in hedges round villages.

Wood very light, yellow, very soft, scarcely used even as fuel. The leaves and fruit are used in country medicine.

Fl. and fr. almost throughout the year.

2. ***S. indicum***, Linn.; Fl. Br. Ind. iv. 234; Brandis Ind. Trees 489. Vern. *Bhut-Kutai*.

A much branched under-shrub, 1-6 ft. high; branches minutely stellate-tomentose, armed with somewhat recurved prickles upto .3 in. long. *Leaves* 2-6 in. long by 1-3 in. broad, ovate, acute sub-entire or sinuate-lobed, cuneate or truncate, sometimes sub-cordate at the base, often unequal-sided, sparsely prickly and stellate-pubescent on both sides; petiole .5-1 in. long. *Flowers* in extra-axillary racemose cymes 1.5-2 in. long; pedicels .3-.5 in. long, tomentose, often prickly. *Calyx* .15 in. long, 5-toothed; teeth triangular, acute. *Corolla* blue, rotate, .4-.5 in. diameter, stellate-pubescent on the outside; lobes .2 in. long, triangular, acute. *Berry* .3-.35 in. diameter, globose, yellow when ripe, usually glabrous.

Common on waste lands in Dehra and Saharanpur Districts
Fl. Aug.-Sept.

3. *S. torvum*, Swartz; Fl. Br. Ind. iv. 234; Brandis Ind. Trees 489.

A tomentose shrub about 6-10 ft. high, branchlets mostly herbaceous with few prickles. *Leaves* 3-7 in. long by 2-4 in. broad, sinuate or coarsely-lobed, ovate, acute, unequal-sided, often more or less cordate at the base, sparsely stellate tomentose above, densely so beneath; prickles very few, usually 1 or 2 on the mid-rib beneath; *petiole* .5-2 in. long. *Flowers* in extra-axillary, dense dichotomous cymes, much shorter than the leaves; *pedicels* .2 in. long. *Calyx* unarmed, .15 in. long, 5-lobed, pubescent. *Corolla* white, .5-.75 in. across; *lobes* triangular, stellate-pubescent outside. *Berry* .4-.5 in. diameter, yellow.

Common in ravines near Dehra. Fl. Dec., March.

This plant is very similar in appearance to *S. indicum* but can be distinguished from it by the leaves having only 1 or 2 prickles on the midrib beneath, denser cymes and flowers which are always white.

S. Melongena, Linn.: Fl. Br. Ind. iv. 235. Vern. *Baigun* Hind., brinjal. The Egg-plant.—Widely cultivated throughout India for its fruit. It has blue flowers about 1 in. diameter and a smooth purple berry which in cultivation often becomes very large.

Var. *insanum*, Prain (sp. Willd.). It is a wild form often met with in waste places and by roadsides throughout the Dûn. It is much more prickly with smaller and more grey-pubescent stems and leaves and a globose yellow fruit about 1 in. diameter.

S. hispidum Pers.—A prickly shrub about 5-8 ft. high, clothed with ferrugineous stellate tomentum. *Leaves* 4-8 in. long by 2-5 in. broad, ovate, or elliptic, acute, sinuate or coarsely lobed, stellate-tomentose and somewhat rough above, ferrugineous tomentose below with a few prickles on the midrib; *petiole* .5-1.5 in. long, ferrugineous tomentose. *Flowers* in short, dense, extra-axillary ferrugineous tomentose cymes on short peduncles. *Corolla* white, about 1 in. diameter. *Berries* globose, .5 in. diameter. It is a native of Peru and is beginning to be naturalised in ravines in the Dûn and Mussoorie. Fl. Most part of the year.

S. Seaforthianum, Andr.—A pretty, somewhat woody nearly or quite glabrous climber with thin leaves, lower usually pinnately parted, upper sometimes entire, about 6 in. long with bluish purple flowers borne in preduncled axillary compound cymes on slender

pedicels. *Corolla* rotate, about .75 in. diameter. *Berries* globose, .4 in. diameter, red when ripe.

It is a native of Tropical America and is much cultivated on walls for ornament. Fl. July-Sept.

S. jasminoides, Paxt. A pretty climber similar to the above with ovate-lanceolate leaves 1.5-2.5 in. long, glabrous except in the axils of nerves beneath and white flowers about .8 in. diameter in many-flowered cymes. It is native of South America and is much cultivated in gardens.

Fl. March-Oct.

S. Pseudo-Capsicum, L.—A low erect undershrub 2-3 ft. high with spreading branches. *Leaves* 2-5 in. long, oblanceolate or oblong, entire or repand, bright green and shining, attenuate at the base into a short petiole. *Flowers* extra-axillary, solitary or in few-flowered, umbellate cymes. *Corolla* rotate, 5-parted, white or purple. *Berries* globose, .5 in. diameter, bright red when ripe.

Native country uncertain. It has become naturalised in various parts of the Dún.

Fl. Aug. Fr. May.

2. *Withania*, Pauq.

W. somnifera, Dunal; Fl. Br. Ind. iv. 239; Brandis Ind. Trees. 490, Gamble Man. Ind. Timb. 508. Vern. *Asgandha*.

An erect undershrub up to 5 ft. high; branches minutely stellate-tomentose. *Leaves* 2-4 in. long by 1.2 in. broad ovate, subacute, entire, thin, base cuneate, more or less minutely stellately pubescent; *petiole* .25-.5 in. long. *Flowers* usually about 5 together in sessile or subsessile axillary umbelliform cymes. *Pedicels* 0-1.5 in. long. *Calyx* campanulate, stellate-tomentose, 5-6 toothed; enlarged and subglobose in fruit. *Corolla* campanulate .3 in. long; lobes 3-6, valvate, short, lanceolate, acute, tomentose outside. *Stamens* 5, attached near the base of the corolla; *anthers* broadly oblong, dehiscing longitudinally. *Ovary* 2-celled; *ovules* numerous. *Berry* .25 in. diameter, red, globose, smooth, enclosed in the much enlarged, inflated, membranous, somewhat 5-angled, pubescent calyx.

Dehra Dun; Raipur, etc.; not common

Fl. July-Sept.

All parts of the plant are used in medicine and the fruit possesses the property of coagulating milk.

3. *Datura*, Linn.

D. fastuosa, Linn. ; Fl. Br. Ind. iv. 242 Vern. *Kala dhatura*.

An erect perennial, 2-4 ft. high ; stems woody below, purplish towards the tips. *Leaves* upto 3-8 in. long, by 2-4 in. broad, ovate or ovate-lanceolate, acute or acuminate, sinuate or repand-dentate, base cuneate, unequal-sided ; *petiole* 1-2.5 in. long. *Flowers* solitary, erect, pedicelled ; *pedicel* .3 in. long, stout. *Calyx* tubular, herbaceous, upto 3 in. long ; *teeth* 5, triangular-lanceolate, acuminate, base persistent and reflexed in fruit. *Corolla* funnel-shaped, 5-7 in. long, about 4-5 in. diameter at the mouth, violet or purplish outside, white within ; *limb* 5-plicate and 5-angled, folds long-cuspidate. *Stamens* 5, attached near the base of the corolla-tube. anthers included, linear, longitudinally dehiscent. *Ovary* 2 or spuriously 4-celled ; *style* filiform ; *stigma* 2-lobed. *Capsule* globose, 1.25 in. diameter, dehiscent irregularly, covered with short spines or blunt tubercles.

Fairly common in Dehra and Saharanpur Districts on waste ground often appearing as if wild.

Various parts of the plant are used in medicine.

D. suaveolens, H. & B. The trumpet flower.—A shrub 6-8 ft. high with elliptic subentire leaves, narrowed at both ends and sweet-scented, white, pendulous flowers upto 10 in. long and a lanceolate or lanceolate-oblong smooth capsule about 4 in. long.—much cultivated in gardens, and is now beginning to run wild in wet shady places in Dehra. It is a native of Mexico.

Fl. April-Sept.

The following cultivated plants belonging to this family also need mention :—

Lycopersicum esculentum, Mill.—The Tomato. Vern. *Walayat baigan*. Cultivated in gardens and occasionally met with as an escape. It originally came from Tropical America.

Capsicum annuum, Linn., *Capsicum frutescens* Linn. The chillies. vern. *Lal mirich*. They are both natives of South America and largely cultivated throughout the area.

Nicotiana tabacum, Linn.—The Tobacco plant. Vern. *Tamaku* ; *Tambaku* ; It is grown more or less throughout India. It probably came from S. America.

Cestrum nocturnum. Linn.—Lady of-the Night ; Mexican jasmine. A sub-scandent evergreen shrub about 10 ft. high with lanceolate acuminate leaves, 3-5 in. long by 1-1.8 in. broad and pale yellowish-green flowers in axillary nearly leafless or terminal more

or less leafy panicles, very fragrant at night. It is indigenous to America and is largely cultivated in gardens in the Dún and Saharan-pur District. It is very easily propagated by cuttings.

C. aurantiacum Lindl.—A bushy shrub with ovate-lanceolate, shortly acuminate leaves, 2-5 in. long by 1-25-2 in. broad, narrowed towards the base into a long slender petiole, light green, glossy and glabrous on both surfaces; *petiole* .3-1-5 in. long. *Flowers* in cymes running into lateral and terminal panicles. *Corolla* .75 in. long, tubular-funnel-shaped, orange-coloured.

Cultivated in Dehra and Mussoorie at Barlowganj. It is a native of Guatemala. Fl. Nov.-Dec.

C. Parqui, L' Herit —A glabrous shrub with lanceolate or oblong-lanceolate, acuminate, entire leaves, 2-4 in. long by .7-1 in. broad, narrowed into a short petiole, foetid, when bruised. *Flowers* sessile, in cymes forming axillary or lateral open panicles. *Corolla* tubular-campanulate, .7 in. long, greenish-yellow with spreading lobes, very fragrant at night.

Cultivated in Dehra and Mussoorie. It is a native of South America. Fl. most part of the year.

Brunfelsia latifolia Benth.—A small shrub with spreading branches and elliptic, acute or obtuse, entire leaves, 2-4 in. long by .8-1-5 in. broad, dark-green and glabrous above, pale and sometimes minutely pubescent beneath; *petiole* 0-15 in. *Flowers* in terminal usually 3-flowered cymes, fragrant, pale violet changing afterwards to white; *corolla*-tube .8 in. long, with 5 rounded nearly equal spreading lobes.

Cultivated in Dehra and Mussoorie. It is indigenous to Tropical America. Fl. April-June.

Order 8 —PERSONALES.

LXI. SCROPHULARIACEÆ.

Mostly herbs, rarely shrubs or trees. *Leaves* usually opposite, rarely alternate or whorled, exstipulate. *Flowers* bisexual, usually more or less irregular. *Calyx* inferior, usually persistent; *lobes* 5, rarely 4. *Corolla* hypogynous, more or less 2-lipped. *Stamens* usually 4

didynamous, or sub-equal, with or without a staminode, rarely 5 or only 2; *anthers* 1 or 2-celled, the cells distinct or more or less confluent. *Ovary* 2-celled, *ovules* usually many on axile placentas. *Style* simple; *stigma* capitate or 2-lobed. *Fruit* usually a capsule.

Verbascum Thaspus, Linn.; Fl. Br. Ind. iv. 250. Vern. *Gidar-tamaku* (Jackal's tobacco).

A tall conspicuous woolly herb about 5 ft. high, often perennial; stem robust, winged with the prolonged leaf-bases. *Leaves* alternate, entire or nearly so; radical and lower cauline stalked, 6-15 in. long by 1-4 in. broad, obovate-lanceolate; upper sessile, oblong or oblong-lanceolate, acute or acuminate. *Flowers* nearly sessile crowded in simple terminal woolly spikes about a foot long. *Calyx* .35 in. long, 5-lobed; *lobes* imbricate, densely woolly. *Corolla* yellow, rotate; *lobes* 5, spreading, nearly equal, broad, obtuse, woolly outside, the 2 posterior outside in bud. *Stamens* 5; *filaments* 3 short and hairy, 2 longer and glabrous. *Stigmas* capitate. *Capsule* ovoid, tomentose, about .4 in. long.

Dehra Dún and Mussoorie.

The plant has narcotic properties and the seeds are sometimes used to stupify fish.

Fl. April.

Russelia juncea, zuccar.—A handsome shrub 3-4 ft. high with rush-like ribbed green stems, small whorled leaves and scarlet flowers. *Corolla* tubular; *stamens* 4. Common in gardens. It is a native of Mexico.

LXII. BIGNONIACEÆ.

Usually trees, sometimes woody climbers, rarely herbs. *Leaves* usually opposite, pinnately compound, sometimes undivided; stipules none. *Flowers* bisexual irregular, showy, generally in terminal panicles, or racemes. *Calyx* free, 2-5-lobed, truncate or spathaceous; lobes valvate in bud. *Corolla* often 2-lipped; lobes 5, unequal, imbricate in bud. *Stamens* epipetalous, usually 4 and didynamous,—the fifth wholly absent or rudimentary, or rarely fertile and then nearly equalling the others. *Ovary* superior, free, 2-celled, more or less

stipitate and supported by an annular disk; ovules numerous; style filiform; stigma 2-lobed. *Fruit* an elongated 2-valved capsule; seeds winged, exalbuminous.

Analysis of the Genera.

- | | |
|---|-------------------|
| Perfect stamens 5; capsule flat, septicidally 2-valved; seeds discoid . . . | 1 OROXYLUM. |
| Perfect stamens 4; capsule terete, loculicidally 2-valved; seeds wedge-shaped . . . | 2. STEREOSPERMUM. |

1. *Oroxylum*. Vent.

O. indicum, Vent., Fl. Br., Ind. iv. 378; Gamble Man. Ind Timb. 510; Brandis Ind. Trees 496. Syn.—*Calosanthes indica*, Bl.; Brandis For. Flora 347. Vern. *Tarhi*, Dún; *Pharrái*, *Pharnát*, E. Dún; *Tantiá*, Garhwal.

A small tree with few branches and a small open crown; bark soft, light brownish-grey and corky outside. *Leaves* opposite, 3-pinnate near the base, 2-pinnate about the middle, and simply pinnate towards the apex, 4-6 ft. long; pinnæ 3-4 pairs; 2-3 lower pairs bipinnate at the base, the pinnules being 3-5 foliolate. *Ultimate leaflets* 3-5 by 2-3.5 in., broad-ovate, acuminate, entire, glabrous. *Flowers* large, fleshy, in lax terminal racemes; peduncle 2-3 ft., pedicels 1-1.5 in. long. *Calyx* 1 by .6 in., leathery, thimble-shaped. *Corolla* campanulate; tube green outside; limb 2-3 in. across; lobes 5, dark-red. *Stamens* 5, all fertile and nearly equal. *Capsule* septicidally 2-valved, shortly stipitate, 18-30 by 2.5-3.5 in., scabhard-like; seeds surrounded by a broad transparent white papery wing, 2-2.5 in. across, including the wing.

Fairly common in the DÚN and SAHARANPUR FORESTS, and on the OUTER HIMALAYAN slopes up to 4,000 ft.

Wood yellowish-white, open-grained, very light and soft, scarcely used except for fuel. Weight 30 lbs. per c. ft.

"The bark and fruit are used in tanning and dyeing, and the seeds are used to line hats, and placed between two layers of wicker-work to make umbrellas. Root, bark, leaves, and seeds are used in native medicine."—*Sir D. Brandis*.

Leafless Mar., April. Fl. June, July. Fr. Cold season.

2. *Stereospermum*, Chamisso.

1. *S. suaveolens*, DC. ; Fl. Br. Ind. iv. 382 ; Brandis For. Flora 351, Ind. Trees 495 ; Gamble Man. Ind. Timb. 515. Vern. *Pádál*, Hind.

A large deciduous tree, young parts viscous hairy ; bark grey, exfoliating in large flat scales. *Leaves* opposite, 12-24 in. long, imparipinnate. *Leaflets* 5-9, more commonly 7, 3-6 by 2-3.5 in. broad elliptic, acute or acuminate, sharply serrate on young, entire on old trees, coriaceous, scabrous or velvety-tomentose ; lateral nerves 6-8 pairs ; petiolules about .1 in. *Flowers* dark-purple, pubescent, fragrant, in viscid trichotomous panicles. *Calyx* .2-3 in., campanulate, shortly 3-5-lobed. *Corolla* 1-1.5 in. long, very soft ; tube cylindrical, throat hairy ; limb oblique, 2-labiate ; lobes rounded, with curled edges. *Stamens* 4, didynamous, with a rudimentary fifth. *Disk* fleshy, annular. *Capsule* loculicidally 2-valved, 15-24 by .6-.8 in., obscurely 4-ribbed, dark-grey with elevated white specks ; dissepiment cylindrical, brown, corky ; seeds 1.5 by .3 in. including the two oblong wings which are lateral and set somewhat obliquely like those of an electric fan.

Fairly common in the DÙN and SAHÁRANPUR FORESTS especially in Sál areas, with a tendency to become somewhat gregarious on clayey soil.

Sapwood white, fairly hard. Heartwood small, yellowish-brown, mottled with darker streaks, very hard, seasons and polishes well, and is fairly durable ; weight 40-50 lbs. per c. ft. Sir D. Brandis says it is "much valued for building and generally commands a ready sale" ; but it does not seem to be much cared for in this area. It yields excellent charcoal, and the root and bark are used in Hindu medicine.

New leaves and fl. May, June. Fr. Cold season, but remaining long on the tree.

1. *Millingtonia hortensis*, Linn. ; Fl. Br. Ind. iv. 377. The Indian Cork-tree, Vern. *Akás Nim*, Hind.—is a handsome tall tree, with fragrant white flowers, cultivated in avenues and gardens in DEHRA and most places in the plains.

2. *Amphicome emodi*, Lindl. ; Fl. Br. Ind. iv. 385 ;—is an herbaceous plant found in the crevices of limestone rocks in JAUNSAK, e.g., Mátkángrá, and along the pipe-line between Chakrata and Deoban. *Leaves* alternate, imparipinnate ; leaflets about 1 in.

Flowers bright rose, about 2 in. long. *Capsule* terete, about 9 in. long.

Tecoma stans, Juss; Trumpet-Flower—A large shrub with pinnate leaves; *leaflets* 7-11, 3-4 in. long, lanceolate, long-acuminate, serrate or deeply gashed. *Flowers* golden-yellow in terminal corymbose racemes or panicles. *Corolla* funnel-form-campanulate, about 1-5 in. long. *Capsule* 5-7 in. long, linear, compressed. Very common in gardens. It is a native of Tropical America. Fl. Sept.-March.

Tecoma grandiflora, Delaun; Chinese Trumpet-Creeper. A handsome climbing shrub with imparipinnate leaves; *leaflet* 7-11, about 2-4 in. long by 1-1.5 in. broad, ovate to ovate-lanceolate acuminate, coarsely serrate, glabrous. *Flowers* orange-scarlet in loose terminal panicles. *Corolla* about 2 in. long; *tube* short, broad. Cultivated in gardens. It is a native of China and Japan.

Fl. May-Sept.

Bignonia venusta, Ker-Gawl. An evergreen climbing shrub with opposite pinnately 2-foliate leaves and a terminal 3-fid slender tendril; lower leaves often 3-foliate, ovate, acuminate, gland-dotted, about 3 in. long by 2 in. broad. *Flowers* orange-red in terminal, drooping, corymbose racemes, very showy. *Corolla* 2-3 in. long, slightly curved upwards.

Common in gardens. It is a native of Brazil. Fl. Jan.-Mar.

Kigelia pinnata, DC.; Brandis Ind. Trees 492; Sausage-tree. A medium-sized spreading tree with alternate impari-pinnate leaves crowded at the ends of branches; *leaflets* 7-9, 3-7 in. long by 1-4 in. broad, elliptic-oblong or obovate shortly acuminate, base unequal-sided, coriaceous, dark-green, scabrid on both surfaces, the lower shortly petiolulate, the upper sessile. *Flowers* dull liver-coloured, in lax racemes hanging by long rope-like peduncles upto 6 ft. long. *Corolla* about 5 in. diam. broadly campanulate; *tube* short; *limb* sub-bilabiate; *lobes* 4-5, spreading. *Stamens* 4. *Fruit* elongate, woody, indehiscent, gourd-like, about 2 ft. long. Cultivated in gardens and as a roadside tree. It is indigenous to Tropical Africa. Fl. May-July.

Jacaranda ovalifolia, R. Br.—A small tree with opposite bipinnate leaves, resembling that of an *Albizia* or an *Acacia*. *Flowers* about 2 in. long mauve or light-blue in large terminal panicles. *Corolla-tube* curved; throat wide, limb 2-lipped; *stamens* 4. *Capsule* ovate, obtuse, 3 in. long by 2 in. broad, compressed at right angles to the septum. Seeds winged.

Common in gardens. It is a native of Brazil. Fl. April-May.

Fam. LXIII. ACANTHACEÆ.

Herbs or shrubs, rarely trees, usually with swollen joints. *Leaves* opposite, simple, exstipulate. *Flowers* with large persistent bracts and bracteoles. *Calyx* 5-partite. *Corolla* 2-lipped, or subequally 5-lobed; lobes imbricate or twisted in bud. *Stamens* 4 or 2, inserted on the corolla-tube. *Disk* often conspicuous. *Ovary* superior, 2-celled; ovules anatropous, 1 or more in each cell; style filiform, sometimes bifid. *Fruit* a loculicidal capsule, often elastically dehiscent. *Seeds* exalbuminous, ovoid or compressed, usually hard, seated on up-curved horny processes of the placenta, often clothed with white elastic hairs which are best seen when wetted.

Analysis of the Genera.

Ovules 2 in each cell.

Calyx-segments 4, the outer pair larger;

perfect stamens 2 5. BARLERIA.

Calyx-lobes 5.

Corolla lobes subequal.

Stamens 4; corolla tubular-ventricose.

Bracteoles large, reticulated, scarious

in age 1. PETALIDIUM.

Bracteoles small or 0.

Anther-cells spurred at the base;

capsule with a contracted solid base 6. ASYSTASIA.

Anther-cells not spurred at the base 4. STROBILANTHES.

Stamens 2, corolla-tube long linear . . . 2. DAEDALACANTHUS.

Corolla 2-lipped.

Bracts cuspidate; corolla white with purple spots, less than .75 in. long .

8. LEPIDAGATHIS.

Bracts not cuspidate; corolla white without purple spots, more than .75 in. long

9. ADHATODA.

Ovules 3 or more in each cell; capsule 6-8

seeded.

Corolla-lobes subequal; stamens 4 . . . 3. AECHMANTHERA.

Corolla 2 lipped, stamens 2 2. PHLOGACANTHUS.

1. *Petalidium*, Nees.

P. barlerioides, Nees; Fl. Br. Ind. iv. 416; Brandis Ind. Trees 499.

An erect finely pubescent shrub 3-5 ft. high. *Leaves* 2-5 in. long by 1-2.5 in. wide, broadly ovate, acuminate, crenate-serrate, nearly glabrous above, pubescent below, especially on the nerves; *petiole* .4-.75 in. long. *Flowers* nearly sessile, axillary, solitary or in short leafy racemes; *bracts* none; *bracteoles* foliaceous, ovate, acuminate, .75 in. long, strongly net-veined, scarious when old. *Calyx* deeply 5-lobed, glandular-hairy, .35 in. long; lobes linear. *Corolla* 1-2.5 in. long, white; tube ventricose upwards, hairy outside, the palate fulvous-hairy; lobes 5, rounded, the margins crenate. *Stamens* 4, didynamous, anthers slightly pubescent. *Ovary* glabrous; *style* hairy, unequally 2-lobed; *ovules* 2 in each cell. *Capsule* shortly stalked, .5 in. long, compressed, glabrous, usually 2-seeded.

In ravines near Dehra, also not uncommon along the banks of the Jumna, near Ambari; Sansarukhala; etc. Fl. Mar.-May.

2. *Dædalacanthus*, T. Anders.

Perennial herbs or shrubs. *Leaves* opposite, entire or obscurely toothed, lineolate narrowed into the petiole. *Flowers* in bracteate spikes; *bracts* usually large, imbricating, *bracteoles* linear-lanceolate, shorter than the calyx. *Calyx* 5-lobed, lobes narrow. *Corolla* slender, tube long, narrow, widened at the mouth, lobes twisted in bud, spreading in flower. *Stamens* 2; *anthers* oblong, muticous. *Ovary* 2-celled glabrous; *ovules* 2 in each cell; *style* long; *stigma* linear. *Capsule* clavate with solid cylindric base. *Seeds* 4, finely hairy.

Analysis of the species.

- | | |
|--|-----------------------------|
| Spikes forming a panicle; bracts shortly | |
| acuminate, not ciliate | 1. <i>D. nervosus</i> . |
| Spikes solitary; bracts much acuminate, | |
| ciliate | 2. <i>D. purpurascens</i> . |

1. **D. nervosus**, T. Anders; Fl. Br. Ind. iv. 418; Brandis Ind. Trees 499

An erect nearly glabrous shrub 2-6 ft. high. *Leaves* 6-8 in. long by 2-5-3-5 in. broad, elliptic or ovate, acuminate, entire or crenulate, lineolate, glabrous or pubescent on the nerves, attenuate at the base; *petiole* .5-1-5 in. long. *Flowers* in bracteate spikes 1-3 in. long forming dense erect terminal panicles; *bracts* leaf like, more or less white with green nerves, ovate or elliptic, shortly acuminate nervose, glabrate, the margin not ciliate; *bracteoles* shorter than the calyx, narrowly lanceolate. *Calyx* .25 in. long, lobed half-way down, minutely pubescent; lobes 5, linear-lanceolate. *Corolla* deep blue 1-25 in. long, glabrous; tube elongate, cylindric, dilated near the top; limb oblique, spreading, .75 in. diameter; lobes 5, subequal rounded. *Stamens* 2; anthers muticous, exerted. *Ovary* 2-celled glabrous; *ovules* 2 in each cell. *Capsule* shortly stalked, oblong, .5 in. long. *Seeds* usually 4.

Frequent in shady places in the Dún. i.e., Gularghati; Saia; Nalapani; Rajpur; etc. Often cultivated in gardens for its handsome flowers. Fl. Feb.-Mar.

2. *D. purpurascens*, T. Anders; Fl. Br. Ind. iv. 420; Brandis Ind. Trees 499.

An undershrub 2-4 ft. high similar to *D. nervosus*; upper leaves often rounded or cordate at the base. *Spikes* solitary, dense, long-peduncled, 1-2-5 in. long; *bracts* ovate-lanceolate, long acuminate, ciliate on the margins, about 1 in. long; *Corolla* 1-5 in. long, lilac or pale-blue, minutely pubescent or nearly glabrous.

Shady banks in the Dún and Mussoorie; i.e. Kalsi; Paunda, etc. Fl. May-Oct.

3. *Æchmanthera*, Nees.

1. *Æ. tomentosa*, Nees; Fl. Br. Ind. iv. 428; Brandis Ind. Trees 504; Gamble Man. Ind. Timb. 518.

A small shrub. *Leaves* 3-5 by 2 in., broad-lanceolate, acuminate, slightly crenate, coarsely pubescent, base rounded, *petiole* 1-1-5 in. *Flowers* in clusters of 3-8, arranged in axillary and terminal trichotomously-branched panicles. *Bracts* .5 in. long; bracteoles narrow. *Sepals* .5 in. long, linear, usually viscous. *Corolla* purple, 1 in. long, tubular-ventricose, nearly straight, suddenly widening near the middle; segments rounded, twisted in bud. *Stamens* 4, didynamous; anthers obtuse. *Capsule* .3-.5 in. long, narrow-oblong, 8-seeded. *Seeds* apparently glabrous, but are seen covered with white weak hairs when wetted.

Top of the SIWALIKS and OUTER HIMALAYAN slopes 3-5,00 ft.: Málkôt, above Rájpur, etc. Also in inner valleys in JAUNSAIR and TEHRI-GARHWAL, e.g., Dhárágádh, Lunágádh, etc.

Fl. Dec. and Jan. at intervals of 5 (?) years when the plant dies in the same way as some *Strobilanthes*. It thus died over

large area in the Lúnágádh Valley in TEHRI-GARHWAL in the spring of 1900.

Vár. *Wallichii*, Nees; Vern. *Bair-ra*, *Bharará*, Málkôt;—has stems covered with dense snow-white wool and leaves with silky tomentum which is of a delicate purple colour, at least when young. It flowers gregariously after 4 or 5 years and dies as soon as the seeds are mature. Outer slopes of the HIMALAYA: Málkôt Forest. Also Ámláwa Valley in JAUNSAAR and in the SIWALIKS, e.g., behind Sháhjahánpur, and in the Timli and Mohand Passes.

4. *Strobilanthes*, Bl.

Small shrubs or herbs. *Leaves* frequently unequal, toothed or subentire, often with raphides. *Flowers* in axillary or terminal spikes or panicles. *Bracts* deciduous or persistent; bracteoles small or 0. *Calyx* usually deeply 5-fid, segments narrow, equal or unequal. *Corolla* tubular-ventricose, curved or straight; lobes 5, subequal, twisted in bud. *Stamens* 4 and didynamous, or 2. *Capsule* 4-2 seeded. *Seeds* compressed, hairy or glabrous; hairs, if present, elastic when wetted.

Analysis of the Species.

Fls. in spikes; (lvs. never quite glabrous.)

Bracts imbricate; leaves sessile, auriculate. 1. *S. auriculatus*.

Bracts not imbricate.

Bracts persistent.

Spikes 1-sided; leaves elliptic, the upper cordate.

Sepals linear, glabrous, corolla nearly straight

5. *S. Wallichii*.

Sepals obtuse, viscous-hairy; corolla-tube cylindric for nearly half its length

7. *S. glutinosus*.

Sepals obtuse, hairy; corolla much curved

6. *S. atropurpureus*.

Spikes symmetrical; leaves elliptic, none ever cordate

4. *S. angustifrons*.

Spikes panicled; leaves ovate, with usually a cordate or rounded base

3. *S. alatus*.

Flowers in pedunculate heads (leaves narrowed at both ends)

2. *S. Dalhousianus*.

1. *S. auriculatus*, Nees; Fl. Br. Ind. iv. 453; Brandis Ind. Trees 500; Gamble Man. Ind. Timb. 519.

A small shrub; branches quadrangular, often zigzag. *Leaves* variable and often very unequal in the same pair, from 10 by 2.25 in. to 3 by 1.5 in., sessile, auriculate, serrulate, sparsely hairy above. *Spikes* 3-4 by .5 in., mostly terminal, solitary. *Bracts* broader than long, .2-.3 in. long, persistent, with aromatic glandular hairs. *Calyx* velvety; segments .2-.3 in., unequal. *Corolla* 1 in., bluish-purple, curved; tube short, narrow; limb slightly 2-lipped. *Capsule* glabrous, 4-seeded, .3 in. long; seeds elastically hairy.

Throughout the DÚN and on the OUTER HIMALAYAN slopes upto 4,000 ft. Very common at Lachiwála.

Fl. Nov.-Mar.

Fl. Rainy season.

2. *S. Dalhousianus*, Clarke; Fl. Br. Ind. iv. 460, Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519.

A suberect shrub, 2-3 ft. high; stems hairy. *Leaves* 4-6 by 1.3-2 in., elliptic, acuminate at both ends, serrate, minutely lineolate on the upper surface, puberulous on the nerves on both surfaces. *Petiole* .5-1.5 in. long. Flowers in peduncled heads. *Bracts* .2-3 in. long, orbicular, concave, whitish, usually glabrous, caducous. *Calyx* glandular-pubescent or glabrate, subscarious; lobes linear-oblong, one larger than the others. *Corolla-tube* yellow, 1-1.5 in. long, somewhat narrowed at the neck; limb oblique, purple; lobes rounded, emarginate. *Capsule* .5-.6 in. long, 4-seeded.

HILLS, 6,-8,000 ft. Fairly common.

Fl. Rainy season.

3. *S. alatus*, Nees; Fl. Br. Ind. iv. 464; Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519. Vern. *Mashnoi*, *Lálor*, Jaunsar.

A small shrub; branches quadrangular. *Leaves* 4-6 by 2-3 in., ovate, acute or acuminate, crenate or serrate; nerves 7-9 pairs of which 4-5 pairs are crowded near the base; base cordate or rounded; petiole 1-3 in., often slightly winged; upper leaves sessile. *Spikes* forming terminal panicles. *Bracts* caducous. *Sepals* .3-.4 in., ligulate, unequal. *Corolla* about 1 in. long, purple, campanulately ventricose, curved beyond the calyx, with 2 hairy lines within. *Capsule* narrow, .75 in. long, elliptic, hairy, 4-seeded; seeds ovate, hairy, .3 in. long.

JAUNSAR and TEHRI-GARHWAL, above 6,000 ft.: Deoban, Konáin, Mundáli; Deotá., etc.

Fl. Rainy season.

4. **S. angustifrons**, Clarke; Fl. Br. Ind. iv. 466.

A small shrub with terete branches; old stems glabrous, young parts, inflorescence and leaves white-tomentose. *Leaves* 3-4 by 1-5-2 in., elliptic, acuminate at both ends, glabrescent, pale beneath; nerves 6 pairs; petiole .5-.7 in.: upper leaves never cordate. *Spikes* terminating in small heads and forming short irregular panicles. *Bracteoles* .1 in., linear. *Calyx* linear, .3-.5 in. long, pubescent. *Corolla* about 1 in. long, purple, nearly glabrous, narrow: mouth curved. *Capsule* .3-.5 in. long, 4-seeded; seeds hairy, .1 in. long.

Common in the DŪN and on the OUTER HIMALAYAN slopes upto 6,000 ft.: Lachiwála, Rájpur; Málköt.

Fl. Jan.-Mar.

5. **S. Wallichii**, Nees; Fl. Br. Ind. iv. 471; Brandis Ind. Trees 500; Gamble Man. Ind. Timb. 519. Vern. *Jánú.* or *Zánú.* Jaunsar.

A small shrub with quadrangular stems; upper portion herbaceous and renewed every year. *Leaves* 3-5 by 1-2 in., elliptic, acuminate, glabrescent, crenate-serrate; nerves 6-8 pairs; base acute, petiole 1-1.5 in.: upper leaves sessile, cordate. *Spikes* 1-6 in., one-sided. *Flowers* blue, usually in pairs. *Bracts* gradually smaller, persistent. *Sepals* ligulate, .3 in. long., often with glandular hairs. *Corolla* 1-1.5 in. long, nearly straight, very gradually ventricose; segments round. *Capsule* linear, .5-.7 in. long; seeds 4, .1 in. long, suborbicular, brown-pubescent.

JAUNSAR and TEHRI-GARHWAL, 7-10,000 ft.: very common.

This plant is remarkable for its gregarious and exclusive habit, and is a pest in places where reproduction of tree species is needed. Its upper portion is herbaceous, and grows and dies every year, adding only one internode to the stumpy lower portion which thus goes on growing until there are about 12 internodes. It then flowers, and dies as soon as the seeds are mature. It is known to have flowered in Jaunsar in 1882, 1894, 1906, and 1918 giving a cycle of 12 years. On the second occasion, the seeds did not germinate until March 1896, but by the end of May all old *Strobilanthes* areas were seen thickly covered with a young crop of seedlings of its own and also of a species of *Impatiens*, which usurped the soil when the *Strobilanthes* had died. Being an annual, the former, however, was gradually ousted by the latter.

The leaves and young shoots are greedily browsed by sheep and goats.

Fl. Rainy season at intervals of 12 years. Fr. Sept., Oct.

6. **S. atropurpureus**, Nees; Fl. Br. Ind. iv. 472; Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519.

A perennial shrub often growing in swamps; stem 1-1.5 ft. high, succulent. *Leaves* 2.5-4 by 1-2 in., ovate, acuminate, crenate-serrate, the upper cuneate, petioled or decurrent to the base, very membranous. *Spikes* lax; flowers solitary or paired; lower bracts leaf-like. *Sepals* linear, subobtusate, hairy. *Corolla* 1.5-2 in. long, much curved, blue; ventricle very broad. *Capsule* about 1 in. long; seeds .2 in. long.

Fairly common in damp localities in the HILLS.

Fl. Aug.-Oct.

7. **S. glutinosus**, Nees; Fl. Br. Ind. iv. 458; Brandis Ind. Trees, 500.

A small viscous-hairy aromatic shrub 2-3 ft. high. *Leaves* stalked, 3-9 in. long by 1-3 in. broad, elliptic acuminate, narrowed to the base, crenate-serrate, more or less hairy on both surfaces, especially so on the nerves beneath; *petiole* very variable, upto 2.5 in. long. Flowers pale-purple, in short capitate spikes often interrupted; bracts .3-.5 in. long, leaf-like, ovate, persistent; bracteoles .2-.25 long, ligulate; both densely viscous-hairy. *Calyx* .3-.5 in. long, viscous-hairy, lobes linear, obtuse. *Corolla* 1.75-2 in. long, lower half of the tube cylindric, upper half ventricose; limb 1-1.5 in. diameter; lobes spreading obcordate. *Stamens* 4. *Capsule* .7 in. long, viscous-hairy. Seeds shaggy.

Outer Himalayas upto 6,000 ft. Mussoorie; Dehra Dún.

Fl. Nov.-Feb.

5. **Barleria**, Linn.

Shrubs or undershrubs, armed or not. *Leaves* opposite, entire. *Flowers* showy, sessile, solitary, in spikes or racemes; *bracts* and *bracteoles* present or none. *Calyx* deeply 4-partite; lobes in opposite pairs, the outer pair much larger. *Corolla* funnel-shaped; tube elongate; lobes 5, subequal, imbricate in bud. *Stamens* 2, fertile; anthers oblong, 2-celled; 2 small rudimentary stamens containing a little pollen also usually present and often a rudimentary 5th. *Disk* large, cupular, half enclosing the ovary. *Ovary* 2-celled; *ovules* 2 in each cell; *style* long; *stigma* bifid. *Fruit* an ovoid or oblong

capsule, 2 or 4-seeded below the middle. *Seeds* compressed, usually hairy.

Analysis of the Species.

- | | |
|---|-------------------------|
| Bracteoles linear; outer calyx-segments spinous-toothed | 1. <i>B. cristata</i> . |
| Bracteoles lanceolate; outer calyx-segments strigose | 2. <i>B. strigosa</i> . |

1. ***B. cristata***, Linn.; Fl. Br. Ind. iv. 488. Brandis Ind. Trees 498.

A diffuse hairy undershrub upto 3 ft. high. *Leaves* 2·5-6 in. long by ·75-1·5 in. broad, elliptic-oblong, entire, acute, or acuminate at both ends, lineolate above, hairy on both surfaces; *petiole* ·15-·4 in. long. *Flowers* in short, head-like nearly sessile axillary spikes; *bracts* 0; *bracteoles* conspicuous, ·5 in. long, linear, entire or with a few spinous teeth, mucronate, membranous and prominently veined. *Calyx* 4-parted; segments hairy, the two outer lanceolate, acuminate, mucronate, spinous-toothed, about ·75 in. long, whitish, prominently veined and reticulate; inner 2 narrow, acute, entire, ·3 in. long. *Corolla* pale purplish-blue or pinkish, 1·25-1·75 in. long, hairy outside; tube about as long as the limb, funnel-shaped in the upper part; limb spreading 1 in. across; lobes 5, obovate oblong. *Capsule* ·6 in. long, ellipsoid, usually 4-seeded. *Seeds* orbicular, silky-hairy.

Common in ravines upto 3,000 ft. i.e., Sahansardhar^a Kalsi; Beribara; etc.

Fl. Aug.-Nov.

2. ***B. strigosa***, Willd.; Fl. Br. Ind. iv. 489, Brandis Ind. Trees 498.

An undershrub 2-4 ft. high; branches strigose. *Leaves* 4-8 in. long by 2-4·5 in. broad, ovate or elliptic, acute or acuminate the base long decurrent on the petiole, glabrate, lineolate above strigose on the nerves beneath; *petiole* ·2-1·25 in. long. *Flowers* in dense fulvous-hairy spikes, often crowded at the tops of the branches; *bracts* 0; *bracteoles* ·4-·6 in. long, lanceolate, hairy on the back, margin ciliate. *Calyx* densely strigose, 4-parted; the two outer segments about ·75 in. long, elliptic lanceolate, acute, margins obscurely serrulate, the 2 inner segments smaller, narrower, densely silky-hairy. *Corolla* 1·5-2 in. long, blue; tube pale-blue, upper

part funnel-shaped: lobes 5, obovate-oblong, obtuse. *Capsule* .75 in. long, 4-seeded, glabrous. *Seeds* shaggy.

Fairly common in the Dún and the Siwaliks, *i.e.*, Renadi, etc.
Fl. Nov.-Feb.

6. *Asystasia*, Bl.

A. macrocarpa, Nees; Fl. Br. Ind. iv. 495.

A diffuse minutely tomentose undershrub upto 4 ft. high. *Leaves* 4-6 in. long by 1.5-2.5 in. broad, elliptic or lanceolate, oblong, narrowed at both ends, more or less pubescent on both surfaces; *petiole* .5-1.25 in. long. *Flowers* usually in 1-sided, condensed, pubescent racemes, sometimes racemes upto 5 in. long, erect, lax with the lower flowers opposite; *bracts* .2 in. long. *Calyx* deeply 5-partite: segments .25 in. long, linear-lanceolate, pubescent. *Corolla* 1.25 in. long, tubular-ventricose, purple, pubescent; tube cylindric, much shorter than the ventricose portion. *Stamens* 4, perfect, didynamous; *anther* cells distinctly spurred at the base. *Ovary* 2-celled, cells 2-ovuled; *style* linear, very hairy; *stigma* minutely bifid. *Capsule* 1.4 in. long, pubescent, base solid .6 in. long. *Seeds* .25 in. diameter, much compressed, tubercled, rugose, glabrous.

Dehra Dun and outer Himalayas, *e.g.*, Bindal nala; Robbers' cave; below Mussoorie; etc.

Fl. April-Nov.

7. *Phlogacanthus*, Nees.

1. P. thyrsiflorus, Nees; Fl. Br. Ind. iv. 512; Gamble Man. Ind. Timb. 523; Brandis Ind. Trees 501.

An evergreen shrub upto 8 ft. high; bark smooth, grey; branches 4-angled. *Leaves* 6-8 by 1.5-3 in., lanceolate or oblanceolate, tapering at both ends, subentire, glabrous, deep glossy-green, densely punctulate; *petiole* .7-1 in. *Inflorescence* a thyrsoid terminal panicle upto 12 in. long. *Bracts* .2 in., linear. *Calyx* deeply 5-fid; tube .1 in. long; segments .2-.3 in. long, bristle-like, pubescent. *Corolla* tubular, orange to brick-red, villous; tube .7-1.2 in. long, curved upwards; upper lip sub-erect. *Fertile stamens* 2. *Capsule* 1-1.2 by .1 in., 4-cornered, glabrous, 12-14-seeded; seeds compressed, covered with elastic hairs.

Common in the Dún, on the OUTER HIMALAYAN slopes up to 4,000 ft., and also in ravines in the SAHARANPUR SIWALIKS, *e.g.*,

Bádsháhibágh, Dholkhand, and Ráni ráus. Always in shady moist localities.

8. *Lepidagathis*, Willd.

L. cuspidata, Nees ; Fl. Br. Ind. iv. 519.

A small brushy shrub 1-3 ft. high ; young shoots glandular-pubescent. *Leaves* variable, the lower 2-4 in. long by .7-1.5 in. broad, oblong-lanceolate, acuminate, usually mucronate, tapering at the base and decurrent into the petiole, minutely tomentose, the upper subsessile, about an inch long, elliptic-lanceolate, cuspidate, softly pubescent. *Flowers* in short, dense, terminal, villous spikes 1-3 in. long, often terminating short axillary branches ; *bracts* .4-.5 in. long elliptic, narrowed at both ends, cuspidate, 3-nerved, densely glandular-pubescent ; *bracteoles* .3 in. long, 1-3-nerved, glandular-pubescent. *Calyx* about .5 in. long, deeply 5-lobed, glandular hairy ; segments unequal, the outer longer, broader than the inner, the 2 inner lateral, linear, all acute, spine-tipped. *Corolla* .5 in. long, white with purple spots, pubescent outside, tubular-ventricose ; upper lip ovate, acute, entire or notched, the lower 3-lobed, lobes rounded. *Stamens* 4, didynamous ; *anthers* 2-celled, bearded. *Ovary* 2-celled, glabrous ; *ovules* 2 in each cell ; *style* recurved ; *stigma* capitellate. *Capsule* .3 in. long, ovoid-lanceolate, acute, glabrous. *Seeds* 4, compressed.

Dehra Dun, the Siwalik Range, and outer Himalayas i.e., Barkot ; Ramgarh ; Rajpur ; etc. Fl. Mar.-April.

Often cultivated in gardens for its flower and deep-green glossy foliage.

Fl. Feb.-Apr. Fr. Apr.-June.

9. *Adhatoda*, Nees.

L. A. Vasica, Nees ; Fl. Br. Ind. iv. 540 ; Gamble Man. Ind. Timb. 523 ; Brandis Ind. Trees 498. Vern. *Bánsá*, Dún ; *Arúsá*, Hind. ; *Vásiká*, Sans.

An evergreen and gregarious shrub with a fetid smell. *Leaves* 4-8 by 1.5-3 in., lanceolate or elliptic, acute at both ends, minutely pubescent especially when young ; lateral nerves 8-12 pairs ; *petiole* 1-1.5 in. *Inflorescence* a dense short-pedunculate bracteate spike, 2-4 in. long. *Bracts* .7 by .5 in., ovate or obovate, sessile ; *bracteoles*, .7 by .2 in. *Calyx* .3-.5 in. long, deeply 5-lobed ; lobes equal, lanceolate. *Corolla-tube* .3-.5 in. broad, white, lower portion short and barrel-shaped ; lower lip with two lines of oblique purple bars.

Stamens 2; filaments dilated; anther-cells acute at the apex, scarcely spurred at the base. *Capsule* .7 in., clavate, longitudinally channelled, pubescent, 4-seeded; seeds .2 in. long, glabrous, tubercled.

Exceedingly common in the DUN AND parts of SAHARANPUR DISTRICT and also found in JAUNSAIR in valleys up to 4,000 ft.,—generally in moist or shady localities, and everywhere remarkably gregarious.

The leaves are considered valuable in Hindu medicine as a specific for cough and asthma. They are mixed with manure in the Punjab, presumably to keep off injurious insects. The flowers are used as a medicine for asthma and ophthalmia. The wood is white, moderately hard and very even-grained. It is used for gunpowder charcoal, and is turned into beads in Bengal. Every part of the plant is exceedingly bitter. Horses seem to be fond of the leaves.

Fl. Dec.-Apr. Fr. Feb.-May.

Thunbergia coccinea, Wall.; Fl. Br. Ind. iv. 393.—An extensive climber with long pendent branches. *Leaves* 3-5 in. long by 1.5-3 in. broad, broadly ovate, or elliptic, acuminate, glabrous, entire sinuate or toothed, base more or less cordate, 3-5-nerved. *Flowers* scarlet to orange, in lax pendulous racemes about a foot or more in length. *Bracts* persistent; *bracteoles* .75 in. long, purple, or dark orange, often connate along one edge. *Calyx* a crenulate rim. *Corolla* about an inch in diameter. *Capsule* 1-1.5 in. long, globose, narrowed suddenly into a flat beak.

Commonly cultivated in gardens and is sometimes met with as an escape in ravines near Dehra. i.e. Bindal nala. Fl. Dec.-Mar.

Order 9—LAMIALES.

LXIV. VERBENACEÆ.

Herbs, shrubs or trees, with quadrangular stems. *Leaves* opposite or whorled, simple or digitate, very rarely pinnate; stipules none. *Flowers* irregular, rarely regular, usually bisexual, in bracteate simple or panicked cymes. *Calyx* 5-4-toothed, persistent, often enlarged in fruit, sometimes coloured. *Corolla* gamopetalous, more or less oblique, 2-lipped or

subequally 4-5-lobed. *Stamens* usually 4, rarely more or fewer, didynamous or rarely equal. *Ovary* superior, 2-carpellary, 2-4-celled, with usually 1 ovule in each cell; style terminal; stigma usually 2-lobed. *Fruit* a dry or fleshy drupe with 1-4 one-seeded pyrenes or a 1-4-celled endocarp, rarely a 4-seeded capsule; seeds exalbuminous.

Analysis of the Genera.

- | | |
|---|------------------|
| Flowers in dense capitate spikes | 1. LANTANA. |
| Flowers in cymose panicles. | |
| Corolla regular, stamens equal; | |
| Calyx not accrescent; drupe with 4 one-celled pyrenes | 2. CALLICARPA. |
| Calyx much accrescent; drupe with a 4-celled endocarp | 3. TECTONA. |
| Corolla 2-lipped, 5- or 4-lobed; stamens didynamous. | |
| Drupe with 1 pyrene. | |
| Leaves simple. | |
| Flowers very small, white | 4. PREMNA. |
| Flowers large, yellow | 5. GMELINA. |
| Leaves digitate (flowers less than .5 inch) | 6. VITEX. |
| Drupe with 4 pyrenes; leaves simple. | |
| Drupe succulent; calyx usually coloured and enlarged in fruit | 7. CLERODENDRON. |
| Drupe dry; calyx not enlarged in fruit. | |
| Calyx broadly salver-shaped, scarcely lobed, coloured | 8. HOLMSKIOIDIA. |
| Calyx small turbinate, deeply 5-lobed, not coloured | 9. CARYOPTERIS. |

1. *Lantana*, Linn.

L. Camara, Linn.; Fl. Br. Ind. iv. 562; Syn.—*L. aculeata* Linn.; Brandis Ind. Trees 502.

A straggling aromatic shrub 4-8 ft. high with small recurved prickles on the branches. *Leaves* opposite, simple, 1-3 in. long by .5-2 in. broad, ovate or ovate-oblong, acute, base subcordate, truncate or cuneate, crenate-serrate. rugose above, scabrid on both surfaces;

petiole .2-.8 in. long. *Flower* in pedunculate, short, capitate spikes which appear subumbellate when young; *peduncles* 1-3 in. long; *bracts* .25 in. long, lanceolate, strigose, 3-5-ribbed, exceeding the calyx. *Calyx* small, membranous, very obscurely 4-5 toothed. *Corolla* tubular, cylindric, orange, .3-.5 in. long; tube slender, pubescent; limb 4-lobed, lobes rounded. *Stamens* 4, didynamous, included. *Ovary* 2-celled; *ovule* 1 in each cell; *style* short; *stigma* oblique, subcapitate. *Fruit* drupaceous, .2 in. diameter, greenish blue or black, shining; *pyrenes* 2, 1-seeded.

Common in hedges in the Dun and Saharanpur Districts. It is a native of Tropical America but has become completely naturalised and is a troublesome weed.

The flowers are normally orange, but plants in cultivation show various colours from cream to yellow, crimson and purple.

Fl. most part of the year.

L. indica, Roxb. Fl. Br. Ind. iv, 562. Brandis Ind. Trees 502. An erect shrub 3-6 ft. high with densely hairy branches, without prickles, spikes elongate, upto about .75 in. in flower, elongating in fruit to 1-1.5 in. and ovate acuminate bracts, has not been collected in the Dun but is found in Saharanpur.

Fl. most part of the year.

2. *Callicarpa*, Linn.

1. *C. macrophylla*, Vahl; Fl. Br. Ind. iv, 568; Brandis For. Flora 368, Ind. Trees 512; Gamble Man. Ind. Timb. 525. Vern. *Daia*, Dún and Garhwal.

A shrub with straggling branches; extremities thickly woolly tomentose. *Leaves* 6-10 in. long, ovate or ovate-lanceolate, acuminate, closely crenate, glabrescent above, thickly cottony-tomentose beneath; lateral nerves 12-15 pairs; *petiole* .3-.5 in. *Inflorescence* a dense-flowered globose axillary compound cyme. *Flowers* small, pale rose-coloured. *Calyx* .05 in., minutely 4-lobed. *Corolla* tubular, regular, 4-lobed, about .1 in. long. *Stamens* 4, equal; anthers small, exserted. *Ovary* 4-celled. *Drupe* white, with 4 one-celled pyrenes, spongy-succulent outside when fully ripe.

Swampy localities in the Dún, e.g., Nakraunda, Misirwála, Káluwála, Khairi, and ravines along the base of the HIMALAYA.

Wood soft. The heated leaves are applied as a remedy for relief in rheumatism by villagers.

Fl. Rainy season. Fr. Cold season.

3. **Tectona**, Linn.

1. **T. grandis**, Linn. f.; Fl. Br. Ind. iv. 570; Brandis For. Flora 354, Ind. Trees 505; Gamble Man. Ind. Timb. 526. The Teak. Vern. *Sāigūn*, Hind.

A large deciduous tree often fluted near the base; bark thin, fibrous, light-brown or grey, peeling off in long thin strips; branchlets quadrangular and deeply channelled, with a large white pith. *Leaves* opposite, simple, 12-24 by 10-12 in., gradually becoming smaller and bract-like in the inflorescence, ovate, elliptic or obovate, acute or bluntly acuminate, rounded or shortly cuneate and sometimes decurrent at the base, entire, thickly coriaceous, glabrescent and rough above, stellately soft-tomentose beneath; lateral nerves 8-12 pairs, compound; secondary nerves transverse; petiole 1.5-2.5 in. long, stout, flattened above, sometimes narrowly margined. *Inflorescence* a large dichoto- or trichotomously branched cyme-bearing bracteate terminal panicle 2-3 ft. long. *Flowers* regular, bracteolate, sweet-scented. *Calyx* 6-lobed, stellate-pubescent, globose in bud, salver-shaped and .15 in. across in open flowers much accrescent, globose membranous and about 1 by .8 in. in fruit. *Corolla* rotate, generally 6-lobed, slightly pubescent; tube very short. *Stamens* 6, inserted on the mouth of the corolla-tube; filaments .1-.15 in. long, white. *Ovary* densely hairy; *style* slightly exceeding the stamens. *Drupe* .5-.6 in. diam., globose, covered with dense felt of branched hairs and enveloped by the inflated and loosely fitting enlarged calyx; endocarp very hard, 4-celled. *Seeds* 1-4, obovoid.

Indigenous in CENTRAL and SOUTHERN INDIA and in BURMA. Cultivated in DEHRA DÚN and SAHÁRANPUR, but young plants suffer much from frost in these parts.

Wood moderately hard, strongly scented, dark golden-yellow when freshly cut, turning dark-brown afterwards; annual rings distinct; medullary rays moderately broad, fairly numerous; weight 35 to 50 lbs. per c. ft. Taken all round teak is by far the best timber in India and perhaps also in the world, being capable of use for almost all conceivable purposes. It is in great demand for ship-building and railway-cars throughout the world, and consequently has a much larger export trade than any other Indian timber. An oil is extracted from the wood, which, rubbed on inferior timbers, increases their durability. The leaves are used for thatching and also for wrapping up parcels.

Leafless Dec.-Apr. Fl. Aug., Sept. Fr. Cold season, but remaining long on the tree.

4. **Premna**, Linn.

Trees or shrubs. *Leaves* opposite, simple, entire or toothed. *Cymes* terminal, paniced or corymbose; bracts small. *Flowers* often polygamous, greenish- or yellowish-white. *Calyx* 2-lipped or campanulately truncate or 2-5-toothed, often enlarged in fruit. *Corolla* short, tubular; limb 2-lipped. *Stamens* 4, more or less didynamous. *Ovary* 2- or 4-celled, 4-ovuled. *Drupe* small, globose or ovoid, supported by the persistent calyx; endocarp undivided, 1-4 celled, 1-4-seeded.

Analysis of the Species.

- | | |
|---|--------------------------|
| Leaves short-petioled; calyx 5-toothed,
much enlarged in fruit | 1. <i>P. latifolia</i> . |
| Leaves long-petioled; calyx 4-toothed, not
enlarged in fruit | 2. <i>P. barbata</i> . |

1. ***P. latifolia***, Roxb.; Fl. Br. Ind. iv. 577; Brandis For. Flora 266, Ind. trees 511; Gamble Man. Ind. Timb. 536. Vern. *Bakár*, Dún: *Bakárchá*, Garhwal.

A small tree with greyish-white bark. *Leaves* 3-5 by 2-3 in., ovate, cuneate, rounded, less frequently shallowly cordate and then slightly decurrent at the base, acuminate, undulate, usually entire, softly pubescent, ashy-grey beneath; lateral nerves 7 pairs; petiole .3-.8 in. *Corymb* villous. *Calyx* .08 in., in fruit up to .2 in. *Corolla* about .15 in., throat hairy. *Drupe* .16 in., globose, black when dry.

Var. *mucronata*, Roxb.—differs from the type in having leaves with a cuneate base and longer acumen, corymbs rather flat-topped, and drupes more verrucose. It attains a considerable size in damp localities.

The type is not found in the region of this Flora, but the variety is fairly common in the outskirts of Sál forests in the Dún and also in the scrub forests of the SAHARANPUR DISTRICT, and low valleys in the HILLS: Phándowôla, Lachiwála, Ambári; Ránipur; Bámsu Depôt, etc.

Wood moderately hard, light-purple or pink when freshly cut, considered a good fuel and is used to obtain fire by friction; weight 38-43 lbs. per c. ft.

Leafless Feb.-Apr. Fl. Apr.-June. Fr. Cold season.

2. *P. barbata*, Wall. ; Fl. Br. Ind., iv. 579 ; Brandis For. Flora. 367, Ind. trees 511 ; Gamble Man. Ind. Timb. 535 ; Vern. *Bakár*, Dún ; *Bakárchá*, Garhwal

A small tree with grey bark. *Leaves* 5-6 by 2·5-3·5 in., oblong or ovate, acuminate, rounded or subcordate at the base, usually distinctly but very distantly toothed above the middle, softly pubescent when young, afterwards glabrescent ; lateral nerves 6 pairs ; petiole 1-2 in. long. *Corymbs* 1-2·5 in. diam., glabrate in fruit. *Calyx* ·08 in. long, 4-toothed ; teeth obtuse, not enlarged in fruit. *Corolla* 1-2 in. long, 2-lipped, hairy in the throat. *Drupe* ·2 in., globose, obscurely verrucose.

OUTER HIMALAYA, upto 5,000 ft. : Jharipáni, Rájpur, Kálsi, etc. Also in the SIWALIK TRACT, *e.g.*, Timli Pass.

Fl. Apr., May. Fr. Cold season.

P. herbacea, Roxb. ; Fl. Br. Ind. iv. 581, is a small inconspicuous undershrub, produced annually from woody rootstocks after the jungle fires. *Leaves* sessile, 4 by 2-3 in., cuneate or obovate, serrate, pubescent. *Flowers* greenish-white, 4-lobed. *Drupe* ·25 in. diam., globose. Grass-lands in the DÚN, *e.g.*, Sabhāwála.

5. *Gmelina*, Linn.

1. *G. arborea*, Linn. ; Fl. Br. Ind. iv. 581 ; Brandis For. Flora. 364, Ind. Trees 509 ; Gamble Man. Ind. Timb. 537. Vern. *Gamhár*, *Gumhar*, *Gambhár*, *Kumhár*, *Khamhár*, Hind.

A middle-sized or large deciduous tree ; bark grey or greyish-brown, smooth, exfoliating in scurfy flakes ; branchlets with white specks. *Leaves* 4-8 by 3-6 in., broad-ovate, cordate with a shortly-cuneate glandular base, acute or acuminate, entire, finely tomentose and glaucous beneath ; lateral nerves 6-10 pairs, straight, the lowest pair sub-basal and penniveined with 4-6 strong secondary nerves on either side ; intermediate nerves straight, transverse with the main nerves ; petiole 3-6 in., obscurely channelled above. (The leaves somewhat resemble those of *Trewia nudiflora*, Linn., which, however, are glabrous and have 5 arcuate basal nerves, besides other differences.) *Inflorescence* a terminal panicle with opposite decussate cymose branches. *Calyx* ·2 in. *Corolla* 1-1·5 in. long, 2-lipped oblique, brownish-yellow, densely soft-tomentose outside ; lobes 5 or 4. *Stamens* 4, didynamous. *Ovary* 4-celled, 4-ovuled ; style slender, unequally bifid. *Drupe* ovoid or oblong, ·7-1 in. long ; pericarp leathery, shining, yellow outside when ripe ; endocarp bony

embedded in an aromatic sweetish pulp; seeds usually 1 to 3, lenticular, .2-.3 in. long.

Occasional in mixed forests in the DŪN, in shady localities in those of SAHĀRANPUR, and in the Lower HILLS and up to 4,000 ft. in valleys in the HIMALAYAS.

Wood yellowish or greyish-white, close and even-grained, soft, light, but strong and durable, does not warp or split, and takes a fine glossy polish; weight 30-40 lbs. per c. ft.; no distinct heart-wood. It is excellent for carpentry, but is little used in the DŪN. Valued for posts and boat-making in ASSAM and for drums in the CENTRAL PROVINCES. The fruit, root and bark are used in Hindu medicine, the former being also edible.

Fl. with new leaves in Mar., Apr. Fr. May, June.

6. *Vitex*, Linn.

1. *V. Negundo*, Linn.; Fl. Br. Ind. iv. 583; Brandis For. Flora. 369, Ind. Trees 503; Gamble Man. Ind. Timb. 539. Vern. *Shimālu*, *Sumalu*, *Chhatimal*, *Nishinda*, Dūn; *Son-i*, Jaunsar; *Mallā*, Sahāranpur.

A deciduous shrub with thin grey bark and spreading branches. *Leaves* 3-5-foliolate (simple and more distinctly crenate on luxuriant young shoots), with a raised line across the stem at the base of the petioles. *Leaflets* lanceolate, 1-5 by .3-1.3 in., the lowest pair smallest, sessile or subsessile, the middle pair, if present, more or less distinctly petiolulate, the odd leaflet largest and with a petiolule .3-.6 in. long, entire or distantly crenate above the middle, glabrescent above, grey-pubescent beneath. *Panicles* up to 12 in. long. *Calyx* .1-.15 in., 5-toothed. *Corolla* .2-.5 in., bluish- or purplish-white; limb spreading, 2-lipped, 5-lobed, middle lobe of the lower lip the largest. *Stamens* 4, didynamous, exserted. *Ovary* 2-4-celled 4-ovuled; style filiform, shortly 2-lobed. *Fruit* a succulent drupe supported by the more or less accrescent calyx, .15-.25 in. diam., globose, black when ripe; endocarp normally 4-celled.

Common throughout the DEHRA DUN AND SAHARANPUR DIVISIONS, and planted in hedge-rows in villages. Also in valleys in the HILLS.

The roots and leaves are used in Hindu medicine, and the branches and twigs for basket-making.

Fl. June-Aug. Fr. Cold season.

There seem to be two distinct forms of this species,—one as described above, and the other a somewhat smaller shrub, with leaves more generally crenate, and panicles, flowers and drupes generally

much smaller. This latter flowers later, and is perhaps more common about DEHRA.

7. *Clerodendron*, Linn.

Shrubs or small trees, rarely herbs. *Leaves* simple, opposite or whorled. *Calyx* 5-toothed or lobed, usually enlarged in fruit and coloured. *Corolla-tube* slender; limb spreading, 2-lipped or more or less obliquely 5-lobed. *Stamens* 4, often long-exserted. *Ovary* 4-celled, with 1 ovule in each cell; style filiform, bifid at the apex. *Fruit* a dry or succulent drupe, often lobed.

Analysis of the Species.

Corolla-tube less than 1 in. long.

Leaves subsessile, narrow 1. *C. serratum*.

Leaves long-petioled, broad 2. *C. infortunatum*.

Corolla-tube 3-4 in. long (leaves subsessile, very narrow) 3. *C. Siphonanthus*.

1. *C. serratum*, Spreng.; Fl. Br. Ind. iv. 592; Brandis For. Flora 364, Ind. Trees 508; Gamble Man. Ind. Timb. 543. Vern. *Banbákri*, Jaunsar.

A shrub with annual shoots from a thick woody rootstock. *Leaves* opposite or in whorls of 3, 4-8 by 1-5-2-5 in., oblong, elliptic-oblong or oblanceolate, serrate, smooth, puberulous or glabrate; base cuneate; petiole 0-2 in. long. *Flowers* bluish-white, in terminal panicles; bracts 5-1-5, obovate or lanceolate, often coloured; pedicels 0-25 in. *Calyx* cup-shaped, 2 in. long, shortly 5-lobed. *Corolla-tube* 3-5 in. long, narrow-cylindrical, slightly constricted at the neck; hairy within; mouth oblique, 2-lipped; lobes 3-5 in., oblong. *Stamens* hairy at the base. *Drupe* 3 in. diam., black; pyrenes up to 4.

TEHRI-GABHWAL, 3,500 ft., generally on grassy hill-sides and fire-traces: Thadiár. Bámsu, Moltá, Sendrá, etc.

Fl. May-Aug. Fr. Sept.-Nov.

2. *C. infortunatum*, Gært. n.; Fl. Br. Ind. iv. 594; Brandia For. Flora 363, Ind. Trees 507; Gamble Man. Ind. Timb. 543. Vern. *Kará*, Dún; *Bhant*, Hind.

A deciduous shrub up to 12 ft. high ; bark with large grey raised corky lenticles ; every part of the plant very bitter and with a fetid smell. *Leaves* opposite, 4-9 by 3-6 in., broad-ovate, acuminate, sometimes slightly cordate, entire or obscurely denticulate, roughly hairy above, tomentose or thinly hairy beneath ; petiole 1-6 in. *Panicles* terminal, hairy ; branches and calyx reddening in fruit. *Calyx* deeply 5-cleft ; lobes lanceolate, .3-.4 in. in flower but .8-1 in. deep-red and leathery in fruit. *Corolla* white, tinged with red ; tube cylindrical .7-.9 in. long ; lobes elliptic, acute, .3-.5 in. long. *Stamens* exceeding the corolla-lobes. *Drupe* fleshy, somewhat tetragonal, rather depressed, bluish-black when ripe, enclosed in the accrescent leathery calyx.

Very common as an undershrub in Sál areas in the DEHRA AND SAHARANPUR DIVISIONS, where the leaf-canopy is not open enough for grass.

The bitter leaves and bark are used in country medicine.

Fl. Jan.-Apr. Fr. Rainy season.

3. *C. Siphonanthus*, Br. ; Fl. Br. Ind. iv. 595 ; Brandis For. Flora 364, Ind. Trees 508 ; Gamble Man. Ind. Timb. 543. Vern. *Chingári*, Dún.

A shrub 4-8 ft. high, with herbaceous fluted hollow stems. *Leaves* in whorls of 3-5, 6-9 by 1-1.5 in., narrow-lanceolate, subentire, glabrous, rather hard ; petiole 0-2 in. *Flowers* white fading into yellow, in rigid terminal panicles 9-18 in. long ; pedicels .5-1.5 in. *Calyx* .5 in. long, dark-red and enlarged in fruit ; segments oblong, acute. *Corolla-tube* 3-4 by .2 in., drooping ; lobes .5-.7 in. long, obovate-oblong. *Drupe* ovoid, dark-blue, about .5 in. long, supported by the spreading red calyx.

Fairly common in grass-lands in the DUN ; Raipur, Lachiwála Rámgarh, Dehra, etc. Often cultivated in gardens for its flower.

Sections of the hollow stem are tied round the neck in BENGAL as a charm against various ailments.

Fl. July, Aug. Fr. Cold season.

8. *Holmskioldia*, Retz.

1. *H. sanguinea*, Retz. ; Fl. Br. Ind. iv. 596 ; Brandis For. Flora 370, Ind. Trees 506 ; Gamble Man. Ind. Timb. 544. Vern. *Rithoul*, E. Dún ; *Kápi*, Hind.

A large straggling shrub. *Leaves* opposite, 3-4 by 2-3 in., ovate, acuminate, generally crenate, pubescent ; main lateral nerves about 6 pairs ; base truncately cuneate ; petiole .5-1.2 in. long. *Calyx* .7-1 in. across, salver-shaped, membranous, red-orange, entire

or with a wavy margin. *Corolla-tube* .6-1 in. long, cylindrical, curved, bright-red; limb unequally 5-lobed. *Stamens* 4, didynamous; filaments glabrous; anthers exserted. *Ovary* 4-celled, 4-ovuled; style shortly bifid, glabrous. *Drupe* .2-.3 in. long, obovoid, deeply 4-lobed at the apex; seeds 1-4, oblong.

Outer slopes and foot of the HIMALAYA and shady ravines in the DÚN: Tháno, Kálimatti, Ráipur, etc.; also passes in the DÚN side of the SIWALIKS. Cultivated in gardens at DEHRA.

Fl Oct.-Dec.

9. *Caryopteris*, Bunge.

Spreading shrubs; extremities pubescent or tomentose. *Leaves* opposite, simple, acuminate, minutely gland-dotted. *Cymes* small, dense, axillary or running into a terminal thyrus; bracts small. *Flowers* light-mauve, generally pubescent. *Calyx* 5-fid; segments somewhat accrescent in fruit. *Corolla-tube* short; limb spreading, 2-lipped, middle lobe of the lower lip largest, much crisped. *Stamens* 4, didynamous; anthers exserted. *Ovary* 4-celled, 4-ovuled; style filiform, usually much exserted, shortly bifid. *Fruit* a small globose capsule; valves 4, induplicate, 1-seeded; seeds oblong, erect.

Analysis of the Species.

- Cymes mostly in terminal thyrus; calyx-segments in fruit lanceolate, erect, ribbed . . . 1. *C. Wallichiana*.
 Cymes mostly axillary and corymbose; calyx-segments in fruit triangular, spreading, not ribbed 2. *C. grata*.

1. *C. Wallichiana*, Schauer; Fl. Br. Ind. iv. 597; Brandis For. Flora 370, Ind. Trees 512; Gamble Man. Ind. Timb. 544. Vern. *Chingári*, *Karui*, Dún.

A large shrub with quadrangular branches, bark peeling off in long papery strips; young shoots grey-pubescent. *Leaves* up to 4 by 1.5 in., narrow-elliptic or lanceolate, acuminate, toothed or nearly entire, puberulous; base cuneate; petiole .3-.5 in. *Flowers* sweet-scented, light-mauve, in dense axillary cymes forming thyrus

at the ends of the branches. *Calyx* deeply 5-lobed ; lobes in fruit erect, lanceolate, ribbed. *Corolla-tube* .2-.3 in. long ; lobes slightly larger than the tube, the lower middle one bluish, others white. *Style* more than twice the length of the corolla. *Fruit* .2 in. long, globose, densely pubescent.

Common in ravines and on waste lands in the DÚN and LOWER HILLS ; up to Saiá in JAUN SAR.

Fl. Mar., Apr. Fr. May, June.

2. *C. grata*, Benth. ; Fl. Br. Ind. iv. 597. Brandis Ind. Trees 512 ; Gamble Man. Ind. Timb. 544.

A rambling shrub ; branches brown-pubescent. *Leaves* 3-5 by 1-1.8 in., those near the cymes much smaller, elliptic, acuminate, crenate-serrate or subentire, pubescent ; lateral nerves about 8 pairs in the larger leaves ; base rhomboid or almost rounded ; petiole .3-.6 in. *Cymes* mostly axillary, densely rusty-pubescent, dichotomously corymbose, few-flowered. *Calyx* membranous, pubescent, triangular in fruit, not ribbed. *Corolla* about .3 in. long, faintly bluish, pubescent, glandular. *Style* about twice the length of the corolla. *Capsule* .15-.2 in. diam., globose, slightly ribbed, nearly glabrous.

JAUN SAR and TEHRI-GARHWAL, up to 5,000 ft.—Jharipáni below Mussoorie, Sainji ; Chátrágádh, Khúnigádh, etc.

Fl. Jan.-Apr. Fr. May-July.

The following plants belonging to this Family deserve notice :—

1. *Petrea volubilis*, Linn. ; The Purple Wreath.—A large climber with opposite, ovate or elliptic, entire, scabrous leaves 3-4 in. long. *Flowers* inodorous, in copious terminal racemes. *Calyx* deeply 5-lobed, persistent, pale purplish-blue, strongly veined, which remains long after the corollas have fallen. *Corolla* violet.—A native of Tropical America but cultivated in gardens. Fl. Mar.-April.

2. *Duranta Plumieri*. Jacq. ; Gamble Man. Ind. Timb. 524.—An evergreen bushy more or less thorny shrub with opposite, elliptic, lanceolate or obovate, acuminate, serrate leaves 1-2 in. long. *Flowers* in terminal and axillary racemes. *Corolla* white or blue ; *Fruit* a berry, orange-coloured when ripe.—Indigenous to S. America and West Indies and very commonly cultivated as a hedge plant in the Dún and Saharanpur Districts. Fl. most part of the year. It grows very readily from cuttings.

3. *Verbena bonariensis*, Linn. ; Fl. Br. Ind. iv. 565 ;—a weed which is a native of Brazil, but is found near Mothronwala and other places in the Dûx. *Leaves* sessile, oblong, 3-4 by .5-.6 in., nervose, serrate. *Flower spikes* in terminal corymbs. Fl. Aug., Sept.

LXV. LABIATÆ.

Herbs, rarely shrubs, usually with aromatic oil-glands ; stem quadrangular. *Leaves* opposite or whorled ; stipules none. *Flowers* irregular, in whorls which are either simple, or in simple or panicle spikes. *Calyx* persistent, sometimes enlarged in fruit, 4-5-lobed or 2-lipped. *Corolla* 4-5-lobed or 2-lipped ; lobes imbricate in bud. *Stamens* 4, didynamous, the upper pair sometimes imperfect. *Disk* prominent. *Ovary* 4-lobed, 4-ovelled ; ovules solitary in each cell, erect ; style gynobasic, simple ; stigma usually 2-fid. *Fruit* of 4 usually dry 1-seeded nutlets included in the persistent calyx.

A family of very little forest importance in India, but containing many herbaceous plants of value for medicine, perfume, etc.

Analysis of the Genera.

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| Stamens 2 ; calyx 2-lipped | 5. MERIANDRA. |
| Stamens 4. | |
| Calyx deeply 5-cleft ; segments elongated and feathery in fruit | 3 COLEBROOKIA. |
| Calyx 5-toothed, enlarged in fruit. | |
| Flowers in 6-10-flowered axillary whorls ; fruiting calyx with 5-spathulate reticulate teeth | 6. ROYLEA. |
| Flowers in narrow cylindric spikers ; corolla 4 or 5-lobed | 4. ELSHOLTZIA. |
| Flowers in cymes, arranged in spikes or racemes ; corolla deeply 2-lipped, lower lip boat-shaped | 1. PLECTRANTHUS. |
| Calyx 5-toothed, not enlarged in fruit. | |
| Corolla .25 in. long ; filaments bearded | 2. POGOSTEMON. |
| Corolla .75-1 in. long ; filaments glabrous | 7. COLQUHOUNIA. |

1. *Plectranthus*, L' Herit.

Herbs or undershrubs. *Leaves* opposite or whorled. *Flowers* small, in cymes forming racemes or panicles. *Calyx* 5-toothed, 2-lipped, enlarged in fruit. *Corolla* 2-lipped; upper lip short, broad, recurved, 3-4-fid; lower much larger, boat-shaped, entire, narrowed at the base. *Stamens* 4, included in the lower lip; *anther-cells* usually confluent. *Nutlets* orbicular, ovoid or oblong.

- | | |
|---|----------------------------|
| <i>Leaves</i> opposite, petioled; cymes lax-flowered | 1. <i>P. rugosus</i> . |
| <i>Leaves</i> whorled, subsessile; cymes dense-flowered | 2. <i>P. ternifolius</i> . |

1. *P. rugosus*, Wall.; Fl. Br. Ind. iv. 620; Brandis Ind. Trees 516.

A small shrub, 2-6 ft. high, stellately pubescent, branches slender, strict. *Leaves* opposite, 5-2.5 in. long by .3-1.25 in. broad ovate, or elliptic, obtuse, crenate, rugose above, white-tomentose beneath; *petiole* .2-.4 in. long. *Flowers* in lax axillary cymes, arranged in terminal panicles; *peduncles* and *pedicels* slender, tomentose. *Calyx* .12 in. long, tubular-campanulate, tomentose; teeth 5, small, triangular, nearly equal. *Corolla* white, spotted with purple; tube straight, longer than the calyx; limb 2-lipped, lips much longer than the tube, lower longest. *Fruiting calyx* .16 in. long, very shortly 2-lipped.

Very common on bare hill-sides throughout the hills, about 4,700 ft., e.g., Bamsu, Dharagadh, the Sacred Forest at Koti, etc. Fl. Oct.-Mar.

2. *P. ternifolius*, Don.; Fl. Br. Ind. iv. 621; Brandis Ind. Trees 516.

A rigid white-tomentose shrub 5-6 ft. high. *Leaves* in whorls of 3, 4-6 in. long by 1-1.3 in. broad, lanceolate, acuminate, serrate, base acute, upper surface hairy, rugose, lower white-tomentose; *petiole* .1-.2 in. long. *Flowers* in large terminal cylindric panicles; lower bracts leafy. *Calyx* .12 in. long, tomentose; tube campanulate when in flower elongated and tubular in fruit, upto .2 in. long; teeth nearly equal, sub-acute. *Corolla* white, with pink spots at

the base of the upper lip ; tube curved, longer than the calyx ; limb very short. *Nut-lets* trigonous, acuminate.

Dehra Dun and Siwalik Range ; Asarori ; Karwapani ; Lachiwala ; etc.

Fl. March.

2. *Pogostemon*, Desf.

1. *Pogostemon plectranthoides*, Desf. ; Fl. Br. Ind. iv. 632 ; Brandis Ind. Trees 516.

A large gregarious, very aromatic shrub about 4 ft. high, stems dark purple with a large pith, grey-tomentose when young. *Leaves* opposite 3-7 in. long by 1.5-4 in. broad, ovate, acuminate, double serrate, base rounded or shortly cuneate, membranous glabrous or slightly pubescent on the lower side, lateral nerves arching ; *petiole* .5-2.5 in. long. *Flowers* in dense bracteate whorls, crowded in cylindric spikes 1-4 in. long, forming large terminal panicles ; *bracts* leaf-like, .3 in. long, ovate, acute, softly hairy and glandular ; *bracteoles* linear-lanceolate, often tinged with purple. *Calyx* .2 in. long, glandular-pubescent ; teeth 5, nearly equal. *Corolla* about .3 in. long, white, tinged with pink ; tube .2 in. long, slender, curved ; limb 2-lipped, upper lip longer than the lower, 3-lobed, middle lobe longer and narrower than the 2 obtuse lateral ones ; lower lip shorter than the upper, obtuse, entire. *Stamens* 4, exserted ; *filaments* bearded with lilac moniliform hairs ; *anther-cells* confluent. *Ovary* 4-partite ; *style* shortly 2-fid. *Nutlets* minute, shining, dark brown, when ripe.

Common in shady ravines in the Dun and lower Himalaya, e.g., Kansrao ; Thano ; Jharipani, etc.

The leaves have the smell of black currants. The ashes prepared from the stems are used in some places as manure in paddy nursery beds.

Fl. Rainy season.

P. parviflorus, Benth ; Fl. Br. Ind. iv. 632 ; closely resembles the above, but is usually a smaller plant, less hairy, with stems darker purple, and spikes shorter and more dense flowered and bracts narrower. Common in ravines upto 4,000 ft. in the Hills, e.g., Malkot, etc. The leaves are chewed and poulticed on snake bites. Fl. Cold season.

3. *Colebrookia*, Smith.

1. *C. oppositifolia*, Smith ; Fl. Br. Ind. iv. 642 ; Brandis Ind. Trees 515 ; Gamble Man. Ind. Timb. 547. Vern. *Bindá*, *Bindá*,

Dún and Garhwal; *Lúri*, *Bambher*, Jaunsar; *Káld Bánsá*, *Bintá-lakri*, Saháranpur.

A hoary shrub, under favourable circumstances up to 20 ft. high, with grey bark. *Leaves* opposite, 4-10 by 1·5-3 in., oblong-elliptic, acuminate, crenate, softly tomentose; lateral nerves 12-15 pairs, arcuate; petiole ·5-1 in., stout, white-felted. *Spikes* 2-4 in. long, in many-branched panicles, very numerous, hoary in fruit. *Flowers* about ·1 in. long, in congested clusters at varying distances on the rachis. *Calyx* very small, villous; tube much grooved; lobes elongated and feathery in fruit. *Corolla* white; lobes rounded. *Stamens* 4, usually exserted; anther-lobes round. *Style* 2-fid; lobes subulate. *Nutlets* usually only one, hairy, obovoid.

Common along ravines and raus in the DUN AND SAHARANPUR DIVISIONS; also in low valleys in JAUNSAAR and the OUTER HIMALAYA, up to 4,500 ft.: Silgádh, Binálgádh; Sansárú-Khálá; Bádsháhibágh, etc.

The wood weighs 46 lbs. per c. ft. It is used for gunpowder charcoal. The leaves are applied on wounds and sores.

Fl. Jan., Feb. The fruit-spikes remain long on the plants, almost throughout the year.

4. *Elsholtzia*, Willd.

1. *E. polystachya*. Benth.: Fl. Br. Ind. iv. 643; Brandis Ind. Trees 516; Gamble Man. Ind. Timb. 547. Vern. *Pathoi*, *Pothá*, Jaunsar.

A shrub up to 8 ft. in height, with grey fibrous bark which peels off in long strips. *Leaves* opposite, 3-6 in. long, elliptic-lanceolate, acuminate, serrate or crenate, pubescent, subsessile or minutely petioled. *Flowers* minute, spicate. *Spikes* 4-10 in. long, flowering 3 in. diam., narrower in fruit, strongly aromatic. *Fruiting calyx* tubular, ribbed, ·1 in. long; teeth 5, erect, triangular. *Corolla* white, pubescent; limb 4-fid. *Stamens* 4, exserted, divergent, *Style* subequally 2-fid. *Nutlets* oblong.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, up to 9,500 ft. associated with *Indigofera* in open grassy slopes.

Fl. Aug.-Oct. Fr. Cold season, but remains long on the plant.

5. *Meriandra*, Benth.

Meriandra strobilifera, Benth.: Fl. Br. Ind. iv. 652; Brandis Ind. Trees 515.

A small aromatic shrub 2-5 ft. high. *Leaves* opposite, 2-5 in. long by .75-1.75 in. broad, oblong or lanceolate, crenulate, gradually narrowed from a broad hastate base, upper surface markedly rugose, lower white tomentose; *petiole* .15-.3 in. long. *Flowers* in dense-flowered whorls, crowded in erect, tomentose, axillary and terminal cylindrical spikes 1-2 in. long, often forming panicles; *bracts* .2 in. long, ovate, acute, imbricate, densely woolly outside, becoming hard in fruit. *Calyx* .1 in. long, ovoid, woolly, 2-lipped, upper lip concave, entire, lower 2-toothed. *Corolla* white, .15 in. long; tube as long as the calyx, limb spreading 4-lobed. *Fertile stamens* 2, included; *anther-cells* separate, pendulous from a long connective. *Ovary* 4-partite; *style* 2-fid. *Nutlets* brown, smooth.

Dry rocky places in Jaunsar 5-7,000 ft., e.g., Koti Kanasar; Dungri.

6. Roylea, Wall.

1. *R. calycina*, Briquet., Syn. *R. elegans*, Wall.; Fl. Br. Ind. iv 679; Brandis Ind. Trees 515; Gamble Man. Ind. Ind. 548. Vern. *Karánoi*, Jaunsar; *Titpáti*, Garhwal.

A woody undershrub with grey bark. *Leaves* opposite, 1-2 in. long, ovate, crenately toothed, tomentose beneath; *petiole* about .2 in. long. *Flowers* in 6-10-flowered axillary whorls. *Calyx* 5-lobed, 10-ribbed, rigid. *Fruiting calyx* .5-.7 in. long; lobes as long as the tube. *Corolla* .5 in., white with a touch of pink, 2-lipped; upper lip erect, lower spreading; tube narrow. *Stamens* 4. ascending. *Stigma* subequally 2-lipped. *Nutlets* .1 in. long, obovoid-oblong, smooth.

OUTER HIMALAYA, JAUNSAAR and TEHRI-GARHWAL, upto 5,000 ft., e.g., Málkôt; Rájpur; Saiá; Dhárágádh; Thadiár, etc.

The leaves, which are extremely bitter, are used as a febrifuge by the Jaunsaris.

Fl. Mar., Apr. Fr. Apr., May.

7. Colquhounia, Wall.

1. *C. coccinea*, Wall.; Fl. Br. Ind. iv. 674; Brandis Ind. Trees 516; Jour. As. Soc., Bengal 62, p. 35.

An erect shrub usually 4-8 ft. high. Branchlets, petioles and undersurface of leaves clothed with thick stellate white woolly tomentum. *Leaves* opposite, 3-6 in. long by 1.5-3.5 in. broad, ovate or ovate-lanceolate, acuminate, dentate-crenate, base rounded or subcordate, more or less stellately pubescent above, densely white-tomentose beneath; lateral nerves 8-12 pairs; *petiole* .5-2.3 in. long, densely white-tomentose. *Flowers* pale-red, .75-1 in. long,

in whorls, axillary or forming dense-flowered terminal spikes upto 3 in. long. *Calyx* 3·4 in. long, 10-nerved, 5-toothed, woolly-tomentose outside. *Corolla* 2-lipped, pubescent; hairs often glandular at the tip; tube narrow, incurved, throat inflated; upper lip nearly entire, shorter than the 3-lobed lower lip. *Stamens* 4, ascending; *anthers* conniving in pairs, cells divaricate, confluent. *Nutlets* about 2 in. long, oblong, compressed, tip produced into a wing.

Mussoorie, in open situations and stony ground; near Municipal garden, Happy Valley, etc.

The plant as found within this area appears to be the var. *vestita*, Prain. The leaves on the undersurface are densely clothed with a white woolly tomentum which persists unlike var. *typica* in which it ultimately almost disappears.

The Tūsi plant (*Ocimum sanctum*, Linn.), the Common Mint Vern. *Pudinā*, Hind. (*Mentha viridis*, Linn.), and Peppermint (*M. piperita*, Linn.) belong to this Family. They are cultivated in gardens in SAHARANPUR and the DŪN, and also found wild, probably as escapes, e.g., *Pudinā* at Sahansra-dharā, and *Tūsi* at Rikhikesh and Kasūmri.

The following plants also deserve mention :—

Micromeria biflora, Benth; Fl. Br. Ind. iv. 650.

An aromatic usually tufted undershrub with short wiry stems and a very stout rootstock. *Leaves* opposite, 15·25 in. long by 1·15 in. broad, nearly sessile, ovate, acute, gland-dotted. *Flowers* small, in axillary 2-4 flowered cymes; *pedicels* slender. *Calyx* pubescent, tubular, 13-nerved, 5-toothed. *Corolla* 2-lipped, pink, upper lip erect, notched; lower spreading, 3-lobed. *Stamens* 4, didynamous.—Common on hill-sides near Mussoorie; Jaunsar; Tehri-Garhwal; Arnigadh; Mussoorie; Kathian; Moragadh; etc. Fl. May.

Thymus Serpyllum, Linn.; Fl. Br. Ind. iv. 649. vern. *Hishā*. An aromatic, hairy, more or less procumbent shrub about 6-12 in. high. *Leaves* opposite 2·4 in. long by 1·25 in. broad, nearly sessile, ovate-oblong, entire, gland-dotted on both surfaces. *Flowers* small, purple, in small whorls crowded in short terminal nearly globose spikes, sometimes 1-sexual. *Calyx* 15 in. long, pubescent, gland-dotted, 2 lipped; upper lip broad, shortly 3-toothed, lower deeply 2-lobed, segments linear, ciliate; mouth hairy within. *Corolla* 2-lipped, gland-dotted; tube as long as the calyx; upper

lip nearly erect, flat, notched, lower spreading, 3-lobed. *Stamens* 4, exserted; *anther-cells* separate. *Ovary* 4-partite; *style* 2-fid. *Nutlets* smooth.

Jaunsar and Tehri Garhwal, 7-11,000 ft. Konain; Deoban, etc. Fl. April-Sept.

Orthosiphon rubicundus, Benth; Fl. Br. Ind. iv. 614.

An erect much branched perennial herb 1-2 ft. high with a woody rootstock, the root often furnished with fusiform root-tubers. *Leaves* opposite, 2-4 in. long by 1-1.5 in. broad, sessile or shortly petioled, elliptic-oblong or oblanceolate, obtuse, coarsely serrate-dentate, cuneate at the base, pubescent on both surfaces, especially on the nerves. *Flowers* white, lilac or rose, in distant, 6-flowered whorls in terminal racemes 6 in. or more long. *Corolla* 2-lipped, .3-.5 in. long, its tube twice as long as the calyx. *Stamens* 4.—is fairly common in Dehra Dun and the Siwaliks, e.g., Ramgarh; Motichur; Dholkot; Timli; etc.

Fl. April-Aug.

APETALÆ.

LXVI. NYCTAGINACEÆ.

Herbs, shrubs or trees. *Leaves* usually opposite, entire; *stipules* 0. *Flowers* usually hermaphrodite, regular, bracts often involucrate. *Perianth* gamophyllous, usually petaloid, the lower portion persistent and accrescent; limb 3-5-lobed, the lobes plicate in bud. *Stamens* 1-30, hypogynous; *filaments* unequal, inflexed in bud; *anthers* didymous. *Ovary* 1-celled, free; *ovule* 1, basal, erect. *Fruit* dry, indehiscent, membranous, enclosed in the coriaceous perianth-tube, *Seeds* albuminous.

None of the woody plants belonging to this family are indigenous within the area. The following, however, deserve mention as they are commonly met with :—

Bougainvillæa spectabilis, Willd.; Brandis Ind. Trees 517. A large scrambling more or less thorny shrub with pubescent branches and alternate, broadly ovate or elliptic, acute or acuminate, pubescent leaves and small pale-yellow flowers supported by purple- or magenta-coloured bracts about 1·5 in. long—commonly cultivated in gardens and is a most conspicuous object when in flower.

A variety (known as *B. lateritia*) with brick-red bracts is also common in gardens.

It is a native of Brazil.

B. glabra, Choisy. Similar to the above but branches and leaves glabrous, the latter lanceolate, acuminate, about 1-2 in. long. Bracts magenta-coloured—also grown in gardens. It is a native of Brazil.

Mirabilis Jalapa, Linn.; vern. Gul-i-abbas; Marvel of Peru. A much branched perennial herb with tuberous roots, and ovate-

acuminate leaves about 4 in. long by 2 in. broad. Flowers usually purple but sometimes yellow, white, crimson or variegated—much cultivated in gardens and often grows up from self-sown seed. It is indigenous to Central America. Fl. Aug.-Nov.

LXVII. AMARANTACEÆ.

Herbs, rarely shrubs. *Leaves* generally alternate, exstipulate. *Flowers* small, occasionally unisexual, in spikes, cymes or clusters, supported by scarious bracts and a pair of bracteoles. *Sepals* 5, scarious, persistent. *Petals* 0. *Stamens* 1-5, opposite the sepals. *Ovary* 1-celled. *Fruit* usually a utricle, rarely a berry or a capsule. *Seed* orbicular or ovate, compressed; testa crustaceous.

A weedy Family, not of much forest interest.

Analysis of the Genera.

Leaves alternate; staminodes none.

Rambling shrubs; seeds few or many . . . 1. DEERINGIA.

Erect shrubs; seed solitary . . . 2. BOSIA.

Leaves alternate or fascicled or with opposite and alternate mixed; stamens with staminodes . . . 3. AERUA.

Leaves all opposite; flowers fascicled, 1-2 perfect surrounded by several deformed ones; staminodes none . . . 4. PUPALIA.

1. *Deeringia*, Br.

1. *D. celosoides*, Br.; Fl. Br. Ind. iv. 714; Brandis Ind. Trees 518; Gamble Man. Ind. Timb. 550. Vern. *Chúndri*, Dún; *Latman*, Hind.

A small shrub, very conspicuous when in fruit. *Leaves* alternate, up to 4 in. long, ovate or ovate-lanceolate, gradually diminishing in size towards the ends of the branches; base more or less rounded; petiole .2-1 in. *Spikes* 6-12 in. long, terminal, *panicled*.

Flowers .2 in. diam., greenish-white, very shortly pedicellate. *Sepals* oblong, spreading in fruit. *Stamens* 4-5. *Fruit* a berry, .2 in. diam., scarlet seated on the spreading perianth.

Common in hedges and scrub-forests in the Dún. Young shoots and leaves are good for fodder, and are said to encourage the flow of milk in milch cows. The juice of the ripe fruit is used as a substitute for red ink.

Fl. Sept.-Oct. Fr. Dec.-Jan.

2. *Bosia*, Linn.

1. *B. Amherstiana*, Hook. f.; Fl. Br. Ind. iv. 716; Brandis Ind. Trees 518; Gamble Man. Ind. Timb. 550. Vern. *Bhengoi*, Jaunsar.

A glabrous straggling shrub. *Leaves* alternate, 3-6 by 1-3 in., ovate, acute or acuminate, glabrous; base more or less acute; petiole .2-.7 in. long. *Spikes* both axillary and terminal, never exceeding the leaves. *Flowers* .2 in. diam., 5-merous, green, in compound racemes or spikes. *Sepals* concave. *Bracts* and *bracteoles* green, with white margins. *Stamens* 5. *Stigmas* sessile. *Fruit* a berry, .15 in. diam., globose, crimson when ripe; seeds with a crustaceous testa.

Fairly common in the Tons Valley and other hot valleys in JAUNSAR.

The leaves dry black, and a black dye is obtained from them. The young shoots are eaten fried in ghee. The ripe berries are also eaten. Wood soft, very porous.

Fl. April-July. Fr. July-Oct.

3. *Aerua*, Forsk.

Herbs or undershrubs. *Leaves* alternate, opposite or fascicled. *Flowers* 2-sexual or polygamous, in simple or panicled spikes; *bracts* and *bracteoles* small. *Perianth* membranous, calycine, usually 5-rarely 4-lobed, all or 3 inner woolly. *Stamens* 5, rarely 4; *filaments* subulate, connate with short or long interposed staminodes in a short hypogynous cup; *anthers* 2-celled. *Ovary* ovoid or subglobose, 1-celled; *ovule*

solitary, pendulous from a long basal funicle; *style* simple; *stigma* capitellate or stigmas 2. *Fruit* a membranous utricle or a circumscissile capsule with coriaceous apex.

Æ. scandens, Wall.; Fl. Br. Ind. iv. 727.

A straggling undershrub with long grey tomentose branches. *Leaves* alternate and opposite 1·5-4 in. long by ·5-1·75 in. broad, elliptic or elliptic-lanceolate, acute mucronate, adpressed silky-pubescent on both surfaces, tapering towards the base; *petiole* ·25-·5 in. long. *Flowers* 2-sexual, white, in dense ovoid or oblong, sessile, axillary and terminal white-woolly spikes ·25-1 in. long often forming a lax terminal panicles; *bracteoles* ovate, acuminate, shorter than the sepals. *Perianth* ·1 in. long, scarious; segments 5, lanceolate, acuminate, hairy outside. *Stamens* 5; *stigma* capitellate. *Utricle* broadly ovate, acute.

Common in Dehra Dun, in waste places ascending to 4,000 in the Himalayas, i.e., Biharigarh; Rajpore; Kalsi, etc.

4. **Pupalia**. Juss.

P. lappacea, Juss.; Fl. Br. Ind. iv. 724.

A large straggling undershrub; branches tomentose. *Leaves* opposite, 1·5-4·5 in. long by 1-2·5 in. broad, elliptic or ovate-oblong, acute or obtuse, often shortly apiculate, base rounded or narrowed, tomentose on both surfaces; *petiole* ·2-·6 in. long. *Flowers* in close or distant clusters forming terminal spikes 4-10 in. long; clusters with 1-2 perfect flowers, the rest imperfect, enlarged and reduced to hooked awns in fruit; *bracts* ·1-·15 in. long, ovate, acuminate, scarious, villous, persistent; *bracteoles* ·2 in. long, ovate-oblong, apiculate. Perfect flowers:—*Perianth* ·2 in. long; segments 5, lanceolate, aristate, 3-nerved, densely white-woolly. *Stamens* 5; *filaments* connate below. *Ovary* 1-celled; *ovule* 1, pendulous. *Style* simple; *stigma* capitate. *Fruit* an oblong membranous utricle, suddenly narrowed to the apex, enclosed in the perianth, surrounded by the enlarged, stellately spreading yellowish hooked awns.

Dehra Dun, Siwalik Range and the lower hills, e.g., Lachiwala; Rajpore, etc.

Fl. Sept.-Oct.

Achyranthes aspera, Linn.; Fl. Br. Ind. iv. 730. Vern. *Chirchita*. An erect herb about 4 ft. high with often a woody

rootstock and opposite elliptic, obovate or sub-orbicular, acute, obtuse or acuminate leaves, very variable in size 1-5 in. long by .5-2.5 in. broad and greenish-white, deflexed flowers in terminal spikes which elongate in fruit and reach up to 20 in. in length. *Perianth* .15-.25 in. long glabrous and shining; *stamens* 5, alternating with truncate, fimbriate staminodes. *Fruit* an oblong utricle enclosed in the hardened perianth, disarticulating easily and carrying the spinous bracteoles with it.

A common weed of road-sides and waste places. Fl. April-Sept.

Several species of the genus *Amarantus* belonging to this family are cultivated on account of their economic importance. *A. paniculatus*, Linn. (Vern. *Chua*, *Marsa.*); *A. caudatus*, Linn. (Vern. for seeds-*Ramdana*); *A. gangeticus*, Linn. (Vern. *Chaulai*) are fairly common.

LXVIII. CHENOPODIACEÆ.

Herbs or shrubs. *Leaves* usually alternate; *stipules* 0. *Flowers* small, usually green, 1 or 2 sexual; *bracts* none or only 1; *bracteoles* 0 or 2. *Perianth* simple, calycine; *segments* 3-5, free or connate, imbricate in bud, often wanting in female flowers. *Stamens* usually 5, sometimes fewer, opposite the perianth-segments; filaments usually free, sometimes with intervening staminodes. *Ovary* 1-celled; *ovule* solitary, basal or lateral; *style* terminal; *stigmas* 2-5. *Fruit* usually a utricle enclosed in the enlarged persistent perianth. *Seeds* erect inverse or horizontal.

There are no woody representatives of this Family within the area but the following deserve mention.

Chenopodium ambrosioides, Linn.; Fl. Br. Ind. v. 4.

A tall erect much-branched, often gregarious, aromatic herb up to 5 ft. high; stems striate, more or less glandular-pubescent. *Leaves* 1.5-3.5 in. long by .25-.5 in. broad, oblong-lanceolate, acute or obtuse, sinuate-dentate, the upper almost entire, base narrowed into a short petiole. *Flowers* in minute clusters forming slender axillary and terminal simple or paniculate spikes. *Perianth* 5-

lobed ; segments orbicular-ovate, concave, obtuse, closing over the fruit. *Stamens* 5. *Stigmas* 5. *Utricle* membranous.

A weed in cultivated ground and waste places in and near Dehra Dun, e.g., Rispana ; Lachiwala ; Jhajra ; etc. Fl. Nov.-Feb.

The plant has a strong camphoraceous odour.

Basella rubra, Linn. ; Fl. Br. Ind. v. 20. Vern. *Poi*. A glabrous fleshy perennial climbing herb. *Leaves* 2-5 in. long by 1-3 in. broad, broadly ovate, acute or acuminate, often cordate at the base. *Flowers* sessile, white or red, in lax axillary peduncled spikes 1-6 in. long. *Perianth* fleshy 5-lobed ; segments elliptic obtuse. *Stamens* 5, on the mouth of the perianth-tube. *Fruit* a globose utricle, red, or black, about the size of a pea, enclosed in the fleshy perianth.

Extensively grown in gardens and used as a pot-herb.

Beta vulgaris, Linn. ; Fl. Br. Ind. v. 5 (Vern. *Chukandar*). The Beet. ; *B. benghalensis*, Roxb. (Vern. *Palak*) and *Spinacia oleracea*, Linn. ; Fl. Br. Ind. v. 6. (Vern. *Palak*).—The Spinach—are commonly cultivated in gardens as vegetables.

LXIX. POLYGONACEÆ.

Herbs or shrubs. *Leaves* usually alternate, simple. *Stipules* scarious or membranous, usually sheathing the stem. *Flowers* usually 2-sexual, small, jointed on the pedicels. *Perianth* simple ; *segments* 3-6, persistent, imbricate in bud. *Stamens* 5-8, rarely more or fewer, opposite the perianth-segments ; *anthers* 2-celled. *Ovary* free, superior, flattened or 3-angled, 1-celled ; *styles* 2 or 3 ; *stigmas* capitate or fringed ; *ovule* 1, basal. *Fruit* a small nut, usually enclosed in the persistent perianth ; *seed* 1.

Analysis of the Genera.

- | | |
|---|---------------|
| Perianth-segments 4-5 ; stigmas capitate ;
fruit a compressed or 3-gonous nutlet . . . | 1. POLYGONUM. |
| Perianth-segments 6, the 3 inner much
enlarged in fruit ; stigmas fimbriate ;
fruit a 3-quetrous nutlet . . . | 2. RUMEX. |

1. *Polygonum*, Linn.

Mostly herbs, a few shrubs. *Leaves* alternate; *stipules* membranous, ochreate. *Flowers* 2 sexual, small or minute, clustered, the clusters sessile or in spiciform, capitate or paniced racemes; *bracts* and *bracteoles* membranous, ochreate. *Perianth* 4-5-cleft, green or coloured. *Stamens* 5-8, perigynous; *filaments* often alternate with the lobes of the glandular disk. *Ovary* compressed or trigonous, 1-celled; *ovule* 1; *styles* 2 or 3, free or connate below. *Fruit* a compressed or 3-gonous nutlet included in the persistent perianth.

Many herbaceous species occur within the area but the following 2 only on account of their being woody deserve mention.

Analysis of the Species.

Plants trailing or creeping; flowers in
 spiciform racemes 2. *P. vacciniifolium*.
 Plants more or less erect, flowers in heads 1. *P. chinense*.

1. *P. chinense*, Linn.; Fl. Br. Ind. v. 44.

A rambling or erect shrub 3-5 ft. high. *Leaves* 3-6 in. long by 1·5-2 in. broad, ovate- or oblong-lanceolate, acute or acuminate, entire or crenulate, base very shortly cuneate or subcordate; *petiole* 2-7 in. long, slightly winged above, often 2-auricled at the base; *stipules* white, membranous, up to 1·5 in. long, tubular with long points, afterwards obliquely truncate, sometimes often much split and torn in age, glandular at the base. *Flowers* white or pink, capitate; *heads* 2·5-5 in. diameter, corymbose or paniced; *peduncles* divaricate usually glandular-hairy; *bracts* ovate, acute. *Perianth* 2·5 in. long, 5-cleft; lobes ovate-oblong, obtuse. *Stamens* 8; *ovary* 3-gonous; *styles* 3, connate below. *Nut* trigonous.

This is a polymorphous plant and the following varieties occur in our area:—

Var. *corymbosa*, Meissn.

Leaves oblong-lanceolate, long acuminate, base very shortly cuneate, midrib beneath hairy; peduncles eglandular.

Chakrata; Mussoorie; Nag Tibba near Mussoorie; etc.

Var. *ovalifolia*, Meissn.

Leaves ovate or ovate-oblong, acute at both ends, often subcordate at the base, glabrous, more or less crenulate; peduncles glandular hispid.

Sansaru Khala; Mussoorie, etc.; often grown in gardens in Dehra.

Fl. June-Oct.

2. *P. vacciniifolium*, Wall.; Fl. Br. Ind. v. 33.

A tufted undershrub, rootstock as thick as the little finger, branches slender trailing and creeping. *Leaves* 4-6 in. long by 25-4 in. broad, elliptic, or suborbicular, entire, acute at both ends, glabrous on both surfaces, rather glaucous beneath; *petiole* 1-2 in. long; *stipules* 3-5 in. long, brown, lacinate with many long excurrent nerves. *Flowers* deep pink, in terminal spiciform racemes 1-3 in. long; *bracts* membranous, ovate, acuminate, about as long as the flowers. *Perianth* 15 in. long, 5-cleft. *Stamens* exerted.

Tehri-Garhwal, 10-12,000 ft. on rocks.

Fl. July-Oct.

2. *Rumex*, Linn.

R. hastatus, D. Don.; Fl. Br. Ind. v. 60; Brandis Ind. Trees 521; Camble Man. Ind. Timb. 553. Vern. *Chulmora*. *Bhilmora*.

An undershrub with a stout woody rootstock or sometimes a small shrub up to 3 ft. high; branches numerous, slender, erect, striate. *Leaves* alternate, triangular or hastately 3-lobed, the lobes narrow, almost linear; *blade* 5-1.75 in. long; *petiole* .75-1.8 in. long; *stipules* 1-2 in. long, membranous. *Flowers* pinkish, polygamous, in small clusters on the racemose branches of a large terminal panicle; *pedicels* .05-1 in. long, very slender, elongating in fruit. *Perianth-segments* 6, the 3 inner much enlarged in fruit. *Stamens* 6. *Ovary* 3-angled, 1-celled; *ovule* 1; *styles* 3; *stigmas* fringed. *Fruit* a small 3-angled nut, enclosed in the 3 much enlarged inner perianth-segments which are 15-2 in. diameter, orbicular, notched at both ends, membranous, bright pink and prominently net-veined.

A common weed on waste lands in the Dún and on dry slopes in the hills, ascending to 8,000 ft., e.g., Thano; Kaulagarh; Landour; Mussoorie; etc.

Fl. Oct.-May.

Antigonon leptopus, Hook. & Arn.—The coral creeper—A large handsome climbing shrub with alternate, ovate-cordate leaves and bright pink flowers in large terminal panicles—is largely grown in gardens. It is a native of S. America.

Fl. April-Sept.

LXX. PIPERACEÆ.

Aromatic herbs or shrubs, generally prostrate. *Leaves* alternate, simple, opposite or whorled, entire, often punctate, stipulate or exstipulate. *Flowers* 1- or 2-sexual, in congested catkin-like spikes, supported by peltate bracts. *Perianth* 0. *Stamens* 2-6, hypogynous. *Ovary* 1-celled or of 3-4-carpels free or connate below; *ovule* 1 or many. *Fruit* small indehiscent or of cocci or follicles; seeds with copious mealy albumen. *Embryo* minute.

Piper, Linn.

Perennial herbs or shrubs often climbing usually glandular and aromatic, nodes swollen. *Leaves* alternate, simple, entire, often unequal-sided at the base; *stipules* membranous, enclosing the buds. *Flowers* minute, dioecious or polygamous, very rarely 2-sexual, spicate, the spikes usually leaf opposed; each flower in the axil of a bract, with or without 2 lateral bracteoles. *Perianth* 0. *Stamens* usually 2-4; *filaments* short; *anthers* 2-celled, cells distinct. *Ovary* 1-celled; *ovule* 1, erect; *style* short or 0; *stigmas* 2-5. *Fruit* a small ovoid or globose, 1-seeded berry. *Seed* usually globose.

Analysis of the Species.

Fruiting spikes dense, not interrupted.

Fruiting spikes cylindric, about 1 in. long ;

leaves cordate at the base 1. *P. longum*.

Fruiting spikes globose, .3-.5 in. diameter ;

leaves acute at the base 2. *P. brachystachyum*.

Fruiting spikes interrupted, 2-6 in. long 3. *P. nepalense*.

1. **P. longum**, Linn. ; Fl. Br. Ind. v. 83 ; Brandis Ind. Trees 523 ; Vern. *Pipal*, *Pipar* ; Long Pepper.

A slender undershrub, creeping and rooting below, the branches rambling, often minutely tomentose. *Leaves* 2-5 in. long by 1-5-3 in. broad, ovate, cordate, shortly acuminate, glabrous, membranous, the lower long-petioled, the upper sessile and stem-clasping, all usually 7-nerved at the base ; *petiole* 1-3 in. long. *Flowers* diœcious, spicate ; *spikes* solitary ; *bracts* orbicular, peltate. *Male spikes* narrow, 1-2-5 in. long ; *stamens* 2-3. *Female spikes* .5-.75 in. long ; *ovary* sunk in the thick rachis. *Berries* .1 in. diameter, crowded in cylindric spikes, about 1 in. long by .25 in. broad.

Shady localities in the Dûn and lower hills, e.g., Lachiwala ; Lakhond, etc.

Fl. Sept.

Both root (Vern. *piplamool*) and fruit (Vern. *Pipal*) are used in medicine.

2. **P. brachystachyum**, Wall. ; Fl. Br. Ind. v. 87 ; Brandis Ind. Trees 523 ; Gamble Man. Ind. Timb. 554. Vern. *Pahari pipar*.

A glabrous rambling shrub ; stems often very long, climbing on trees or rocks, swollen and rooting at the nodes ; branches slender terete, the lower usually warted. *Leaves* 2-5-5 in. long by 1-2-5 in. broad, elliptic-ovate or lanceolate, caudate-acuminate, usually 5-nerved, base acute, thinly coriaceous ; nerves prominent beneath ; *petiole* .25-.5 in. long, slender ; leaves of sterile climbing shoots much smaller, ovate or orbicular with rounded base, pale beneath. *Flowers* diœcious, purple, spicate. *Male spikes* ovoid, .3 in. long ; *stamens* 2. *Female spikes* like the male, ovoid, .25 in. long ; *stigmas* 3. *Berries* .1 in. diameter, 1-seeded crowded in nearly globose heads about .5 in. diameter.

Dehra Dun ; Mussoorie and Tehri-Garhwal in damp shady localities, i.e., Renadi ; Bamsu Valley, etc.

Fl. May-July.

3. **P. nepalense**, Miq. ; Fl. Br. Ind. v. 89.

A slender glabrous climber. *Leaves* 3-5 in. long by 1-2·5 in. broad, ovate or ovate-lanceolate, caudate-acuminate, thinly coriaceous, base acute or rounded, more or less oblique, 5-7 nerved; *petiole* ·5-·7 in. long. *Flowers* dioecious, in solitary more or less interrupted spikes 2-4 in. long. *Male spikes* slender; *female spikes* long, puberulous, straight or flexuous; *bracts* orbicular, sessile. *Fruiting spikes* 2-6 in. long. *Berries* ovoid ·3 in. long, pointed, granulate.

Dehra Dun and Mussoorie on steep rocky ground.
Fl. June.

Several species of *Piper* furnish products which are of commercial importance such as *Piper nigrum*, Linn. Vern. *Gol mirch*, *Kali mirch*, (Black pepper) and *P. Betle*, Linn. Vern. *Pan*. (Betel leaf vine) but none of these is indigenous or cultivated within the area of this Flora.

1. *Houttuynia cordata*, Thunb.; Fl. Br. Ind. v. 78.—A small plant with a creeping rootstock. *Leaves* 1·5-2 in. long, broadly ovate, cordate, acuminate; *petiole* 1-2 in. long, stipules membranous. *Spikes* ·5 in. long, elongating in fruit, with a basal involucre of 4-6 large, spreading white petaloid bracts. *Flowers* green, 2-sexual; *stamens* 3. *Fruit* globose consisting of 3 many-seeded follicles. Occasionally met with in hot damp localities in JAUNSAIR and TEHRI-GARHWAL, e.g., Dhármigádh, Khúnigádh, etc. Fl. April-June.

LXXI. LAURACEÆ.

Trees or shrubs, more or less aromatic. *Leaves* usually alternate, simple, exstipulate, generally entire, gland-dotted. *Flowers* 1-2-sexual, regular. *Perianth* inferior, 6-4-cleft; segments imbricate in bud; tube sometimes enlarged in fruit. *Stamens* up to 12, in 2-4 series, usually half or more wanting or reduced to staminodes; filaments flattened and often with 2 glands at the base; anthers 2-4-celled, cells opening by up-curved deciduous valves. *Ovary* superior, 1-celled; ovule solitary, pendulous. *Fruit* a 1-seeded berry or a drupe; peduncle often thickened; seed pendulous, exalbuminous.

Analysis of the Genera.

Flowers paniculate, usually bisexual; anthers of the inner stamens opening outwards.

Fruit supported only by the base of the perianth

1. CINNAMOMUM.

Fruit supported by the entire perianth.

Perianth-segments spreading or reflexed, not stiffened

2. MACHILUS.

Perianth-segments clasping the fruit and stiffened

3. PHŒBE.

Flowers umbellate, usually diœcious; anthers all opening inwards

4. LITSÆA.

1. **Cinnamomum**, Blume.

1. **C. Tamala**, Nees: Fl. Br. Ind. v. 128; Brandis For. Flora, 374, Ind. Trees 533; Gamble Man. Ind. Timb. 560. Vern. *Dálchini*, *Darchini*, Hind.; *Gúr-ándrá*, Jaunsar.

A moderate-sized tree, with thin dark-brown wrinkled bark. *Leaves* both alternate and opposite sometimes on the same twig, 4-6 by 1·5-2·5 in., ovate-oblong, acute or acuminate, 3-nerved, glabrous, shining above, pink when young. *Panicles* scarcely exceeding the leaves. *Perianth* of 6 unequal segments, silky-pubescent; lobes longitudinally ribbed, ovate-oblong, breaking off transversely about the middle in fruit. *Perfect stamens* 9, the 6 outer eglandular with 4-celled anthers opening inwards, the inner three with 2 glands at the base and 4-celled anthers opening outwards; innermost or fourth series of 3 short staminodes. *Ovary* free; style filiform. *Drupe* .5 in. long, ovoid, succulent, supported by the thickened peduncle and the 6-toothed or truncate base of the perianth, black when ripe.

Occurs sporadically in damp ravines in JAUNSAK and TEHRIGARHWAL, up to 6,000 ft.; Thadiár, Bagúr-nálá; Málkôt, etc. Very common and almost gregarious in the Mautárgádh.

The wood is moderately hard and close-grained, but is liable to split and warp; weight 39 lbs. per c. ft. The bark of the twigs is used as a substitute for the true cinnamon, which is obtained from a cogener of this tree (*C. zeylanicum*, Breyn.) and the leaves are the bay-leaves or *Tejját* of Indian commerce.

New leaves April-May. Fl. Feb.-May. Fr. June-Oct., but remaining long on the tree.

C. Camphora, Linn. ; Fl. Br. Ind. v. 134 :—The Camphor tree, is cultivated for ornament in the Dún, where it thrives well on good soil.

2. *Machilus*, Nees.

Evergreen trees. *Leaves* alternate, penniveined. *Flowers* bisexual, in axillary and terminal panicles. *Perianth* divided to the base ; segments 6, persistent but unchanged in fruit. *Stamens* as in *Cinnamomum Tamala* ; anthers all 4-celled. *Berry* globose or oblong, seated on the spreading or reflexed perianth.

Analysis of the Species.

Panicles quite glabrous ; fr. oblong or ellipsoid 2. *M. odoratissima*.

Panicles silky-tomentose ; fr. globose or nearly so.

Leaves 5-10 in. long ; lateral nerves 12-20 pairs 3. *M. Duthiei*.

Leaves 3-6 in. long ; lateral nerves 6-10 pairs 1. *M. Gamblei*.

1. **M. Gamblei**, King mss. ; Fl. Br. Ind. v. 138, 860. Brandis Ind. Trees 531 ; Gamble Man. Ind. Timb. 566.

A moderate-sized tree ; bark dark-grey, with even surface. *Leaves* 3-6 by 1-1.5 in., obovate to elliptic-lanceolate, acute or acuminate, entire, thinly coriaceous, glabrous and shining above, glaucous beneath ; base cuneately acute ; lateral nerve : 6-10 pairs slender ; petioles .5 in. long, slender, glabrous or pubescent. *Panicles* terminal, lax, few-flowered. *Perianth-lobes* linear oblong, villous within. *Filaments* slender, almost glabrous ; anther oblong. *Fruit* .3 in. diam., globose, black when ripe.

Fairly common in shady and swampy localities in the Dún : Káluwála, Rámgarh, Mothronwála, Karwápáni, etc.

Wood white, appears to be soft.

Fl. Mar.-April. Fr. June-July.

2. **M. odoratissima**, Nees ; Fl. Br. Ind. v. 139, 859 ; Brandis For. Flora, 378, Ind. Trees 530 ; Gamble Man. Ind. Timb. 565. Vern. Káwála, Jaunsar ; Káulá, Kaulu, Dún.

A middle-sized tree. *Leaves* 4-6 by 1·5-2 in., lanceolate or oblong, acuminate, dark-green and shining above, slightly glaucous beneath, impressed-punctate, lateral nerves 7-13 pairs; petiole ·5-·8 in. long. *Panicles* peduncled, shorter than the leaves. *Flowers* and *filaments* quite glabrous. *Fruit* ·5-·7 in. long, oblong or ellipsoid, purple and somewhat pruinose when ripe.

JAUNSAR, TEHRI-GARHWAL and OUTER HIMALAYAN VALLEYS, 3,000—6,500 ft.

Wood light, soft and even-grained, not much used. Weight 40 lbs. per c. ft.

Fl. Mar.-April. Fr. May-June.

3. *M. Duthiei*, King mss.; Fl. Br. Ind. v. 861; Brandis Ind. Trees 531; Gamble Man. Ind. Timb. 567. Vern. *Kāwalā Bhojo*, Jaunsar.

A tree larger than the last species; young branches sometimes finely silky. *Leaves* 5-10 by 1·5-2·7 in., lanceolate, oblong or oblanceolate, very coriaceous, glaucous beneath; nerves 12-20 pairs, irregular; petiole ·5-1 in. *Flowers* larger than in the preceding species; perianth lobes linear-oblong, finely silky. *Filaments* glabrous. *Fruit* globose, ·5 in. diam., on thickened pedicels.

Common in shady ravines in the HILLS 5,000-7,500 ft.

Fl. April, May. Fr. June, July.

3. *Phœbe*, Nees.

1. *P. lanceolata*, Nees; Fl. Br. Ind. v. 141; Brandis For. Flora 377, Ind. Trees 532; Gamble Man. Ind. Timb. 568. Vern. *Bhadroi*, *Bhadeu*, Jaunsar; *Tumri*, Dún.

A small evergreen tree with yellowish-white bark. *Leaves* alternate, crowded at the ends of the branches, 5-8 by 1-2 in., narrow-lanceolate, finely or caudate-acuminate, glabrous; lateral nerves 6-10 pairs; petiole ·5-·8 in. *Flowers* 2-sexual or polygamous, in lax axillary panicles. *Perianth* cup-shaped; segments obovate, scarcely acute, pubescent within, enlarging, hardening and imbricate in fruit. *Stamens* as in *Cinnamomum Tamala*; anthers all 4-celled. *Fruit* ·3-·4 in. long, narrow-ellipsoidal, black when ripe, half-buried in the enlarged calyx.

In shady damp valleys or near marshes in the DÚN: Karwá-páni, Rámgarh, Kánsráo, Khairi; also up to 6,500 ft. in the HILLS, e.g., Sainji, Korwá, Mussoorie, etc.

The wood is white, hard and close-grained, but does not seem to have ever been used for timber purposes. Growth fast. Weight 46-55 lbs. per c. ft.

Fl. Feb.-June. Fr. June-Sept.

4. *Litsæa*, Lamk.

Usually evergreen trees or shrubs. *Leaves* alternate, often crowded at the ends of the branches, generally penninerved. *Flowers* dioecious, in few-flowered umbels which are sessile or pedicellate, usually clustered and supported by 4-6 concave involucre bracts. *Perianth* tubular, 4-6-lobed. *Stamens* 6, less often 9 or 12, rarely more, those of the inner series with a pair of glands at the base; anthers 4-celled, all introrse. *Fruit* a drupe, seated on the much-enlarged perianth-tube, black when ripe.

Analysis of the Species.

- | | |
|--|---------------------------|
| Stamens 9 or more; lvs. penninerved throughout. | |
| Leaves grey-tomentose beneath; fr. globose | 1. <i>L. chinensis</i> . |
| Leaves rusty-tomentose beneath; fr. ovoid or oblong. | |
| Leaves broad; receptacle of fruit very small | 2. <i>L. polyantha</i> . |
| Leaves narrow; receptacle of fruit large | 3. <i>L. elongata</i> . |
| Stamens 6; lvs. 3-nerved at the base (Genus <i>Tetradenia</i> , Nees). | |
| Leaves 6-12 in. long, thickly coriaceous | 4. <i>L. lanuginosa</i> . |
| Leaves 3-6 in. long, thinly coriaceous | 5. <i>L. umbrosa</i> . |

1. *L. chinensis*, Lamk.: Syn.—*L. sebifera*, Pers.; Fl. Br. Ind. v. 157; Brandis Ind. Trees 536; Gamble Man. Ind. Timb. 570. Syn.—*Tetranthera laurifolia*, Jacq.; Brandis For. Flora 379. Vern. *Chandná*, Dún; *Maidá-lakri*, Hind.

A moderate-sized evergreen tree with dark-grey soft corky bark; young parts grey-tomentose. *Leaves* 4-10 in. long, elliptic ovate, oblong, or lanceolate, acute or acuminate, pubescent or glabrescent above, grey-tomentose beneath, soft-coriaceous; lateral nerves 8-12 pairs; petiole .5-1.5 in. *Umbels* .3-6 in. diam.; pedicels clustered on a common peduncle .2-.3 in. long; bracts 4, rounded, tomentose. *Stamens* 9-20 or more; filaments hairy. *Fruit* about .3 in. diam, globose, supported by the club-shaped pedicel.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in shady ravines: Rámgarh, Karwápáni, Bádsháhibágh, Dholkhand, etc.

Wood greyish-brown, close- and even-grained, durable, is not attacked by insects; heartwood not distinct; weight 46 lbs. per c. ft. The inner bark, which is granular and viscid, is used as an external application for sprains and bruises.

Fl. Rainy season. Fr. Nov.-Dec.

2. **L. polyantha**, Juss.; Fl. Br. Ind. v. 162; Brandis Ind. Trees 536; Gamble Man. Ind. Timb. 571. Syn.—*Tetranthera monopetala*, Roxb.; Brandis For. Flora 380. Vern. *Karkáwa* or *Karká*, Dún.

A moderate-sized evergreen tree with dark-grey smooth bark. *Leaves* 4-8 in. long, oblong ovate or obovate, tip acute or rounded, glabrous above, rusty-tomentose and strongly reticulate beneath; lateral nerves 5-10 pairs; petiole .5-1 in. *Umbels* stoutly pedicelled, 5-6-flowered; bracts 5, membranous. *Stamens* 9-13; filaments hairy. *Fruit* ovoid, .2-.3 in. long, on a small perianth-base.

Very common in scrub forests in the DEHRA DÚN and SAHÁRANPUR DISTRICTS, and in low valleys in the HILLS.

Wood of a dark-grey colour, not durable; weight 38 lbs. per c. ft. The bark is used in Indian medicine, and the leaves to feed cattle, and the Mugá silkworms in Assam.

Fl. Mar.-April and also irregularly throughout the year. Fr. four months after flowering.

3. **L. elongata**, Wall.; Fl. Br. Ind. v. 165; Brandis Ind. Trees 537; Gamble Man. Ind. Timb. 572.

A small tree with stout branches; branchlets rusty-tomentose. *Leaves* alternate, very variable, generally 4-5 by 1-1.5, but occasionally much longer and broader, oblong or elliptic lanceolate, obtuse acute or acuminate, strongly reticulate and rusty-tomentose beneath; lateral nerves few or many; base generally acute; petiole stout, .3-.5 in. long. *Umbels* 4-5-flowered, very rarely clustered; male

larger than female; pedicels of varying lengths; flowers woolly. *Sepals* 4-6, obtuse. *Stamens* 8-12; filaments slender, villous. *Ovary* glabrous, rudimentary in the male fls.; style stout; stigma discoid. *Fruit* .5 in. long, oblong, seated on a perianth-base which is .3 in. in diam.

Shady ravines in the OUTER HIMALAYA,—along the 'Mall' at Mussoorie, Sansarú Khála in MALKOT, etc. Rather rare.

Fl. Mar.-April. Fr. June-July.

4. *L. lanuginosa*, Nees; Fl. Br. Ind. v. 178; Brandis For. Flora 382. Ind. Trees 540; Gamble Man. Ind. Timb. 573.

A moderate-sized tree with brown bark. *Leaves* crowded at the ends of the branches, 6-12 in. long, elliptic-lanceolate or oblanceolate, acute or acuminate, very tough and coriaceous, silky-hairy when young, afterwards glabrous above, glaucous beneath, strongly sub-triplinerved at the base; petiole .3-.8 in. long. *Bracts* villous. *Umbels* in 4-flowered sessile clusters nearly 1 in. in diam. *Stamens* 6; glands of inner stamens long-stalked. *Fruit* .5 in. long, acute at both ends, seated at the thickened ends of the pedicels.

JAUNSAAR and TEHRI-GARHWAL, up to 6,000 ft.; not common: Bámsu Valley, 4,000 ft. Tons Valley 3,500 ft. Also in the Mothronwála swamp in the DÚN, 1,900 ft.

Wood yellow when fresh cut.

Fl. Feb.-April. Fr. Dec.-Jan.

5. *L. umbrosa*, Nees; Fl. Br. Ind. v. 179; Brandis Ind. Trees 540; Gamble Man. Ind. Timb. 573. Syn.—*L. zeylanica*, Nees; Brandis For. Flora 382. Vern. *Shúrúr*, Jaunsar.

A moderate-sized evergreen tree with a spreading crown and dark-brown bark. *Leaves* alternate, 3-6 in. long, oblong elliptic or oblong-lanceolate, acute or acuminate, thinly coriaceous, glabrous above, glaucous beneath, usually sub-triplinerved at the base; petiole .5-1.5 in. *Umbels* in small 4-5-flowered sessile clusters, few-flowered. *Stamens* 6; glands sessile. *Fruit* .3 in. diam., globose or oblong, on slender pedicels which are .5 in. long.

Common in JAUNSAAR and TEHRI-GARHWAL, 4-7,000 ft., generally in shady forests or ravines.

Wood reddish-white, moderately hard; heartwood distinct with a darker colour; weight 36-38 lbs per c. ft. Used for house-building in South India. An oil is extracted from the fruit, which is used for burning and is considered by the hill people as a specific for itches and other skin diseases.

Fl. Mar.-May. Fr. Sept.-Oct.

LXXII. PROTEACEÆ.

Trees or shrubs, rarely herbs. *Leaves* mostly alternate, entire, toothed or pinnatisect, exstipulate. *Flowers* 2-sexual; inflorescence various. *Perianth* inferior; segments 4, valvately connate in a cylindrical tube in bud, gibbous at the base, at length more or less separating, with recurved tips. *Stamens* 4, opposite to perianth segments; *filaments* short, epiphyllous; *anthers* 2-celled, introrse. *Ovary* superior, 1-celled, often oblique; *style* terminal, thickened at the tip; *stigma* terminal or lateral. *Ovule* 1 or in pairs or many. *Fruit* dehiscent or indehiscent.

Grevillea robusta, A. Cunn. ; Brandis Ind. Trees 544. Silky Oak. A large tree, young shoots ferruginous-tomentose. *Leaves* alternate, pinnate; *pinnae* 4-10 in. long, deeply pinnatifid or entire, the segments usually lanceolate, margins recurved, nearly glabrous above, silky beneath. *Flowers* orange coloured, in short racemes 3-6 in. long, appearing on short leafless branchlets on the old wood; *pedicels* slender, .5 in. long, glabrous. *Perianth* glabrous; segments 4, revolute. *Stamens* 4, opposite to perianth segments. *Fruit* a follicle, oblique, coriaceous, .6-.75 in. long, tipped with the persistent style. *Seeds* 1, or 2, winged all round. It is a native of Queensland and New South Wales and is commonly cultivated in Dehra Dun.

Fl. Mar.-April.

LXXIII. THYMELÆACEÆ.

Small trees or shrubs. *Leaves* alternate or opposite, simple, entire, exstipulate. *Flowers* regular, usually 2-sexual; perianth tubular or campanulate; lobes 4-5, imbricate, sometimes with scales at the base. *Stamens* as many or twice as many as the perianth-

lobes, in the latter case in two superposed series. *Ovary* superior, usually 1-celled; style long or short or 0; stigma capitate; ovule solitary, pendulous. *Fruit* indehiscent.

Analysis of the Genera.

- Leaves alternate, subcoriaceous, persistent; scales and style 0 1. *DAPHNE*.
 Leaves opposite and alternate, membranous, deciduous; scales and style present 2. *WIKSTROEMIA*.

1. *Daphne*, Linn.

D. papyracea, Deene.; Syn. *D. cannabina*, Wall (in part); Fl. Br. Ind. v. 193; Brandis Ind. Trees 544; Gamble Man. Ind. Timb. 577. The Paper *Daphne*. Vern. *Dhák Chamboi*, *Chamua*, Jaunsar; *Satpurá*, Garhwal.

An evergreen shrub 4-6 ft. high, with smooth grey bark. *Leaves* 2-4 in. long, oblanceolate or narrow-lanceolate, subcoriaceous, glabrous; nerves very slender, depressed above, just visible below; petiole short, marginate, channelled. *Flowers* scented, white, in sessile, terminal heads, supported by oblong or lanceolate hairy bracts. *Perianth-tube* 5-7 in. long, slender, white-pubescent outside; lobes 4, short, acute. *Scales* 0. *Stamens* 8, in two series, one above the other. *Stigma* sessile or subsessile, capitate. *Fruit* a berry, 5-7 in. long, ovoid, orange while ripening, deep-red or rusty when fully ripe, succulent, with a coriaceous rind.

JAUNSAR and TEHRI-GARHWAL, 4,000-9,500 ft. Very common in the Korwá and Lúrlí Forests.

In Nepal and Kumaon paper is made out of the inner fibrous bark.

Fl. Mar.-April, often also in autumn. Fr. Two months after fl.

2. *Wikstroemia*, Endl.

1. ***W. canescens***, Meissn.; Fl. Br. Ind. v. 195; Brandis Ind. Trees 545; Gamble Man. Ind. Timb. 578. Syn.—*W. virgata*, Meissn.; Brandis For. Flora 386. Vern. *Chambat*, Jaunsar.

A small shrub with a few slender branches. *Leaves* 1-3 in., oblong-lanceolate, acute, membranous, often slightly pubescent; petiole .1 in. long. *Flowers* yellowish, subsessile, in few-flowered heads, spikes or cymes. *Perianth* .3 in. long, slender, silky outside; lobes 4. *Disk-scales* 1-4, linear. *Stamens* 8, in two series one above the other. *Style* short; stigma large. *Fruit* .2 in. long, narrowly ovoid, silky.

JAUNSAK and TEHRI-GARHWAL, 5,-8,000 ft. : Deoban, Konáin, Mundáli, Kathián; Deotá, etc.

Fl. April-June. Fr. Two months after fl.

LXXIV. ELÆAGNACEÆ.

Shrubs or trees with silvery or brown scales. *Leaves* usually alternate, entire, exstipulate. *Flowers* regular 1-2-sexual, in axillary fascicles or cymes. *Perianth* tubular; lobes valvate in bud. *Stamens* usually 4, epiphyllous, alternating with the perianth-lobes. *Ovary* superior, 1-celled, with a solitary erect ovule. *Fruit* indehiscent, enclosed in the accrescent perianth-tube.

Analysis of the Genera.

Fls. normally 2-sexual; perianth 4-fid . . . 1. ELÆAGNUS.

Fls. 1-sexual, dicecious; perianth 2-partite
or 2-fid 2. HIPPOPHAE.

1. *Elæagnus*, Linn.

Shrubs or small trees, sometimes spinescent. *Leaves* alternate, covered with dense silvery scales beneath. *Flowers* 2-sexual or 1-sexual by abortion. *Perianth tube* constricted above the ovary; lobes 4, valvate, deciduous. *Stamens* 4. *Fruit* with a bony or coriaceous endocarp.

Analysis of the Species.

- An erect deciduous shrub ; leaves narrow ;
 fruit .3 in. long 1. *E. umbellata*.
 A straggling evergreen shrub ; leaves broad ;
 fruit about 1 in. long 2. *E. latifolia*.

1. ***E. umbellata***, Thunb. ; Fl. Br. Ind. v. 201 ; Brandis For. Flora 390, Ind. Trees 547 ; Gamble Man. Ind. Timb. 580. Vern. *Ginrei*, Jaunsar.

A thorny deciduous shrub with numerous branches, often forming a dense bush. *Leaves* 1-3 by .3-.7 in., oblong or lanceolate, acute at both ends, clothed below with bright silvery scales, sparsely scaly or pubescent above ; nerves indistinct ; petiole .2-.3 in. long. *Flowers* dull-white, silvery outside, appearing with the leaves, in small axillary clusters. *Perianth* .2 in. ; lobes triangular-ovate. *Fruit* .3 in. long, oblong-ovoid, succulent, ribbed outside.

JAUN SAR, TEHRI-GARHWAL and outer slopes of the HIMALAYA, usually 3-, 7,000 ft. Between Saia and Korwa ; below Konian. Dhara-gadh, etc.

The fruit is eaten.

Fl. April-June. Fr. Rainy season.

2. ***E. latifolia***, Linn. ; Fl. Br. Ind. v. 202 ; Brandis For. Flora 390, Ind. Trees 547 ; Gamble Man. Ind. Timb. 581. Vern. *Loharu*, Garhwal.

A straggling shrub, often spiny. *Leaves* very variable, usually 3-6 by 1.5-2.5 in., ovate-oblong, acuminate, membranous, clothed beneath with silvery or ferruginous scales ; margins often slightly undulate ; lateral nerves 6-8 pairs ; petiole .3-.4 in. long, channelled. *Flowers* few or numerous, in axillary clusters ; pedicels elongated in fruit. *Perianth-lobes* broad. *Fruit* about 1 in. long, sometimes longer, elliptic oblong or pyriform, strongly 8-ribbed, red or yellow when ripe ; endocarp silky inside.

Mothronwala, Nakraunda and Lachiwala swamps, DEHRA DUN, and possibly in similar places elsewhere.

The acid but somewhat astringent fruit is eaten by villagers. Fl. Nov.-Feb. Fr. May-June.

2. ***Hippophae***, Linn.

1. ***H. rhamnoides***, Linn. ; Fl. Br. Ind. v. 203 ; Brandis For. Flora 388, Ind. Trees 547 ; Gambel Man. Ind. Timb. 581. Vern. *Dhurchuk*, *Taruwa*, *Chuma*. U. P.

A large thorny dicecious shrub, sometimes a small tree ; bark dark-grey, rough with vertical furrows. *Leaves* alternate, .5-2 by .1-3 in., subcoriaceous, glabrescent above, felted with grey or rust-coloured scales beneath. MALE FLS. in axillary clusters on the old wood ; *perianth* with 2 opposite segments. FEM. FLS. axillary, solitary, pedicelled ; *perianth* tubular, 2-denate. *Fruit* oblong or globose, orange or bright-scarlet when ripe, enclosed in the succulent perianth.

UPPER TONS VALLEY, TEHRI-GARHWAL : Dātmin and Osblā ; chiefly in moist gravelly stream-beds.

It is used for fuel and charcoal and the dry branches for hedges. The fruit is very acid, but boiled with sugar forms a palatable preserve.

Fl. Mar.-April. Fr. July-Aug.

Very similar in appearance but somewhat larger is *H. salicifolia*, Don. *Leaves* membranous covered beneath with stellate hairs and scales. Gangottari and other places in TEHRI-GARHWAL.

LXXV. LORANTHACEÆ.

Parasitic evergreen shrubs. *Leaves* generally opposite, exstipulate, entire, coriaceous. *Flowers* 1-2-sexual, usually bractreate. *Perianth* single or double ; the outer (calyx) usually adnate to the ovary, limb truncate or 0 ; the inner (corolla) free or connate, valvate in bud. *Stamens* as many as, and opposite to, the lobes of the inner perianth. *Ovary* inferior, 1-celled with usually one erect ovule. *Fruit* generally drupaceous, 1-seeded ; albumen fleshy.

Analysis of the Genera.

Fls. 2-sexual, showy ; style long . . . 1. LORANTHUS.
Fls. 1-sexual, inconspicuous, style short or 0 2. VISCUM.

1. *Loranthus*, Linn.

Leaves generally opposite. *Flowers* 2-sexual, usually large, showy. *Calyx* adnate to the ovary; limb entire or minutely toothed. *Petals* free or more or less connate into a tube. *Stamens* epipetalous, subequal. *Style* long, stigma capitate. *Fruit* a fleshy drupe.

Analysis of the Species.

Flowers 4-merous.

Petals free; (leaves glabrous) . . . 1. *L. ligustrinus*.

Petals connate into a tube.

Leaves scurfy on both surfaces when young; peduncles many-flowered .

Corolla buff or pink within . . . 2. *L. cordifolius*.

Corolla green within . . . 3. *L. pulverulentus*.

Leaves always glabrous above; peduncles few-flowered . . .

4. *L. vestitus*.

Flowers 5-merous (leaves glabrous; petals

red, connate into a tube) . . . 5. *L. longiflorus*.

1. ***L. ligustrinus***, Wall. : Fl. Br. Ind. v. 207; Brandis For. Flora 395, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern. *Bándá*, Hind.

A parasitic shrub, often apparently terrestrial. *Leaves* opposite, the upper sometimes alternate, 2-3·5 by ·6-1 in., lanceolate, thinly coriaceous, glabrous. *Flowers* ·3 in. long, rust-coloured or pale-pink outside, deep-red inside, in short axillary panicles or racemes; bracts persistent. *Calyx*-limb entire. Corolla of 4 distinct ligulate petals reflexed from the middle. *Ovary* rusty-tomentose. *Fruit* ovoid, ·2-·3 in. long, brown when ripe.

Occasionally met with in the DÚN FORESTS: Rámgarh, Karwápáni, Mothronwála etc.

Fl. May-June.

2. ***L. cordifolius***, Wall. ; Fl. Br. Ind. v. 209; Brandis Ind. Trees 549.

Leaves 2-4 in., opposite, ovate-oblong or obovate, young on both surfaces and old beneath scurfy or grey-tomentose; base rounded or cordate; petiole ·3-·6 in. *Flowers* ·8-1 in., very slender, usually buff outside, in axillary fascicles or short racemes; buds

terete, with an acute tip. *Calyx-limb* wholly truncate. *Corolla* slightly curved, tomentose outside; lobes 4, short, reflexed. *Style* filiform, purple. *Fruit* .25-.3 in., obconic.

Fairly common in the SIWALIK TRACTS.

Fl. Cold season.

3. **L. pulverulentus**, Wall.; Fl. Br. Ind. v. 211; Brandis For. Flora 396, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern. *Parand*, Kumaon; *Bándá*, Hind.

A stout woody parasite with dark-grey bark. *Leaves* opposite, 4-6 in. long, broadly ovate or ovate-oblong, coriaceous, thickly mealy-tomentose when young, base acute or rounded; petiole .5-.7 in. long. *Racemes* .5-2.5 in. long, axillary, solitary or fascicled. *Flowers* 1 in. long. *Pedicels* .2-.3 in. long, grey-scurfy outside. *Calyx-limb* 0. *Corolla* slender, tubular, curved; segments 4, linear, green. *Style* very slender. *Fruit* .3 in. long, turbinate, grey, tomentose.

A common parasite in the DÚN and SAHÁRANPUR FORESTS. Has been found on *Butea frondosa*, *Dalbergia Sissoo* and many other trees.

Fl. Sept.-May, and probably throughout the year.

4. **L. vestitus**, Wall.; Fl. Br. Ind. v. 212; Brandis For. Flora 396, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern., *Pand*, Hind.

A robust woody parasite. *Leaves* opposite=(2-3) by .7-1.2 in., oblong ovate or elliptic, glabrous, deep-green and shining above, densely ferruginous-tomentose beneath; margins recurved; base acute; petiole .2-.3 in. long. *Flowers* .5-.7 in. long, rusty outside, in few-flowered clusters. *Calyx* distinctly toothed. *Corolla* tubular, lobes very short, obtuse; buds with a globose apex. *Fruit* .3-.5 in. long, usually ovoid; seed imbedded in a viscid pulp.

Fairly common in JAUNSAH and TEHRI-GARHWAL and generally found on Oaks, especially *Quercus incana*; e.g., at Kathián, where hardly any tree has escaped.

Fl. throughout the year, chiefly Oct.-Jan.

5. **L. longiflorus**, Desrouss.; Fl. Br. Ind. v. 214; Brandis For. Flora 397, Ind. Trees 549; Gamble Man. Ind. Timb. 583. Vern. *Bándá*, Hind.

A large woody parasite, with handsome flowers. *Leaves* opposite or alternate, 3-10 by .5-5 in., very variable in shape, coriaceous, brittle when fresh, glabrous, young usually pink; nerves

very faint; petiole .3-.7 in. *Flowers* 1.5-2.5 in. long, scarlet or orange, sometimes tipped with green, in axillary or supra-axillary unilateral racemes which are 1-4 in. long. *Calyx-limb* truncate or with short sharp points. *Corolla* tubular, curved, somewhat swollen near the middle, split halfway down at the back; segments 5, linear. *Ovary* cylindrical or urceolate, glabrous. *Fruit* .3-.5 in. long, oblong, black when ripe.

Extremely common, and has been found on most trees in the DŪN and SAHĀRANPUR FORESTS, ascending to 7,500 ft. in JAUN-SAR and TEHRI-GARHWAL, where, however, the flowers are rather smaller and not quite so vividly coloured.

Fl. almost throughout the year but chiefly Nov.-June.

2. *Viscum*, Linn.

Parasitic shrubs with dichoto- or trichotomous branches. *Leaves* opposite or wanting. *Flowers* unisexual, minute, solitary or fascicled in the axils of the leaves, or at the nodes of the branches. *Perianth-segments* 3-4, very thick, usually deciduous. *Anthers* sessile, epiphyllous, opening by many pores. *Stigma* sessile, large. *Fruit* succulent; embryos 1-2 in each seed in fleshy albumen.

Analysis of the Species.

- | | |
|---|----------------------------|
| Branches terete, leafy; flowers diœcious;
berries white | 1. <i>V. album</i> . |
| Branches flattened, leafless; flowers usually
monœcious; berries pale-green or yellow. | |
| Internodes 1-2 in., striate or furrowed;
perianth-lobes deciduous | 2. <i>V. articulatum</i> . |
| Internodes .2-.6 in., with only a middle
line or none; perianth-lobes persistent | 3. <i>V. japonicum</i> . |

1. *V. album*, Linn. : Fl. Br. Ind. v. 223; Brandis For. Flora 392, Ind. Trees 552; Gamble Man. Ind. Timb. 583. The Mistletoe. Vern. *Chūli-kā-Bānda*, Jaunsar.

A large parasitic shrub, green all over; branches dichotomous or whorled, *Leaves* about 2 by .4 in., sessile, cuneate-oblong or

oblanceolate, with 3-5 longitudinal basal nerves. *Flowers* diœcious, sessile, in clusters of 3-5, supported by concave bracts. *Perianth-segments* 3-4, triangular, deciduous. *Fruit* .2-.3 in. long, ellipsoid, white, smooth, almost transparent.

JAUNSAAR and TEHRI-GARHWAL, up to 6,000 ft. (Lambátách) chiefly on Rosaceous shrubs, and on elm, walnut and willows.

It is used medicinally, and bird-lime is made of the viscid pulp of the fruit.

Fl. Mar.-May. Fr. Sept.-Nov.

2. **V. articulatum**, Burm. ; Fl. Br. Ind. v. 226 ; Brandis Ind. Trees 552. Syn.—*V. attenuatum*, D.C. ; Brandis For. Flora 394. Vern. *Budu*, *Pand*, Hind.

A much-branched, leafless, green parasite, greenish-yellow when dry. Main stem terete ; branches flat, longitudinally striate and furrowed, contracted at the nodes, pendulous ; internodes widening upwards, 1-2 in. long. *Flowers* sessile, in sessile 3-flowered spikes, two or several spikes at a joint. *Fruit* subglobose, .15 in. long, yellow when ripe.

The SIWALIKS and OUTER HIMALAYA, up to 6,000 ft. Found on *Cordia vestita*, *Cornus capitata*, *Pyrus Pashia*, etc.

Fl. Rainy season.

3. **V. japonicum**, Thunb. ; Fl. Br. Ind. v. 226 ; Brandis Ind. Trees 552. Syn.—*V. articulatum*, Burm. ; Brandis For. Flora 393. Vern. *Pand*, *Báná*, *Bándá*, Hind.

A much-branched, small, tufted, leafless parasite. Main stem dark-grey, terete ; branches flat and much contracted at the nodes, looking much like strings of beads ; internodes .2-.3 in. long, linear-cuneate, usually with a medial ridge. *Inflorescence* as in *V. articulatum*. *Flowers* very minute ; perianth-segments 3-4, persistent. *Fruit* .1 in. long, globose, greenish-yellow.

JAUNSAAR and TEHRI-GARHWAL, up to 8,000 ft.—Appears to be very partial to the Oaks, especially *Q. incana*, e.g., at Kathián. *Rhus*, *Olea*, *Rhododendron* and Apricot trees have also been known to be attacked.

Fl. May-July. Fr. Oct.-Nov.

Arceuthobium minutissimum, Hook. f. : Fl. Br. Ind. v. 227, Brandis Ind. Trees 553.—A minute leafless parasite ramifying within and appearing as small pustules on the bark of *Pinus excelsa* ; stem rarely upto .2 in. long, jointed. *Flowers* diœcious, minute, at the ends of branchlets which come out through the bark as minute

2-lipped cups.—Has been collected at Gangotri and may occur elsewhere also.

LXXVI. SANTALACEÆ.

Trees, shrubs or herbs, generally parasitic on roots. *Leaves* alternate or opposite, simple, exstipulate, entire, sometimes wanting. *Flowers* regular, small, green, 1-2-sexual. *Perianth* generally superior, campanulate. *Stamens* opposite the perianth-lobes. *Ovary* usually inferior, 1-celled; placentation free-central. *Fruit* a nut or a drupe; seed globose, in copious fleshy albumen.

1. *Osyris*, Linn.

1. *O. arborea*, Wall.; Fl. Br. Ind. v. 232; Brandis For. Flora 399, Ind. Trees 554; Gamble Man. Ind. Timb. 588. Vern. *Dālmī*, *Dālmī*, Garhwal and Kumaon.

A fairly large twiggy shrub parasitic on roots; branchlets sharply 3-angled. *Leaves* alternate, 1-2 in. long, subsessile or with a short marginate petiole, obovate, elliptic-oblong or lanceolate, mucronate. *Flowers* minute, polygamous. MALE FLS. in axillary long-peduncled clusters. FEMALE FLS. usually solitary, axillary, on slender drooping pedicels. *Perianth-lobes* conical, valvate. *Ovary* inferior; placenta very short. *Drupe* sub-globose, .3 in. diam., glabrous, red when ripe.

Not uncommon in the OUTER HIMALAYA and in the SIWALIK TRACTS: Thāno, Mālkūt, Rājpur, Saia, near the watershed behind Rānīpur, etc. Also found at Naintwār in TEHRİ-GARHWAL.

Wood reddish-brown, hard, compact and close-grained.

Fl. Almost throughout the year. Fr. Chiefly cold season.

This small family is the one to which the Sandal-wood, *Santalum album*, Linn.—Fl. Br. Ind. v. 231, Vern. *Chandan*, Hind.,—belongs. *Leaves* opposite, 2-3 in. long, elliptic-ovate. *Flowers* small, inodorous. *Fruit* a globose drupe. This most valuable tree is indigenous in Southern India, particularly in Mysore, it has been successfully grown at DEHRA DŪN.

LXXVII. EUPHORBIACEÆ.

Herbs, shrubs or trees, sometimes with milky juice. *Leaves* alternate or opposite, usually stipulate, rarely compound. *Inflorescence* various. *Flowers* generally small, always unisexual. *Perianth* usually single and calycine, rarely double or wholly wanting. *Stamens* various; anthers usually 2-celled. *Ovary* generally 3-celled, rarely 1-2- or more than 3-celled; styles as many as the carpels, free or connate, entire or divided; ovules 1 or 2 in each cell, pendulous from the inner angle of the cell. *Fruit* a capsule or a drupe, rarely a berry. *Seeds* oily, usually with a copious albumen; radicle superior: cotyledons flat.

Analysis of the Genera.

- Fleshy plants with thick branches and milky juice 1. EUPHORBIA.
 Trees or shrubs, not fleshy.
 Leaves 3-foliate 11. BISCHOFFIA.
 Leaves simple.
 Leaves opposite.
 Leaves 1-3 in. long, evergreen, coriaceous; fruit a capsule . . . 3. BUXUS.
 Leaves 6-9 in. long, deciduous, membranous; fruit indehiscent . . . 15. TREWIA.
 Leaves alternate.
 Leaves gland-dotted beneath.
 Glands red 16. MALLOTUS.
 Glands yellow 17. MACARANGA.
 Leaves not gland-dotted beneath.
 Leaves peltate 19. RICINUS.
 Leaves not peltate.
 Leaves with 3, 5, or 7 basal nerves.
 Leaf-base 3-5 nerved, pubescent when young . . . 18. BALIOSPERMUM.
 Leaf-base 7-nerved, glabrous . . . 14. JATROPHA.
 Leaves penni-nerved.
 a. Leaves large, over 5 in. long
 Leaves crenate-serrate :
 plants with milky juice . 20. SAPIUM (*insigne*). .

Leaves entire.

Petiole short, under 1 in.;

lateral nerves conspicuous, parallel . . . 4. BRIDELIA.*

Petiole 1-2 in. long . . . 12. DAPHNIPHYLLUM.

b. Leaves middle-sized, usually under 5 in. long.

Nerves many, parallel, very conspicuous . . . 4. BRIDELIA.*

Nerves few, not very conspicuous.

Leaves serrulate; fruit a tomentose drupe . . . 9. PUTRANJIVA.

Leaves entire.

Fruit indehiscent.

Shrubs; pericarp thin.

Drupe .3-.4 in. diam.; stamens 4; leaves shining, dark-green, narrow-lanceolate, coriaceous . . . 2. SARCOCOCCA.

Drupe .2-.25 in. diam.; stamens usually 2; leaves dull-green, ovate-lanceolate, somewhat thick . . . 13. ANTIDESMA.

Trees; pericarp coriaceous; fruit .5 in. long . . . 10. CYCLOSTEMON.

Fruit a capsule.

Flowers in racemes;

calyx valvate; cocci undivided . . . 20. SAPIUM (*sebioferum*).

Flowers axillary, solitary or fascicled; calyx imbricate; cocci 2-valved.

Petals 0

Styles free, recurved . . . 8. FLUEGGEA.

Styles confluent . . . 7. GLOCHIDION.

Petals present; pedicels filiform . . . 5. ANDRACHNE.

c. Leaves small, usually under 1 in. long by .25 in. broad . . . 6. PHYLLANTHUS.

* *Bridelia* leaves are very variable, sometimes large, often quite small, according to locality and position on the plant.

1. **Euphorbia**, Linn.

Herbs or soft-wooded shrubs with copious milky juice. *Leaves* alternate, with or without strong stipular prickles, sometimes opposite or whorled especially on flowering branches. *Flowers* in heads resembling single flowers, consisting of a cup-shaped involucre which encloses many male flowers and one central female flower; involucre-lobes 4-5 with thick horizontal glands at the sinuses; glands sometimes winged and petaloid. MALE FL. consists of a pedicelled, articulated, often bracteolate stamen; anther-cells usually globose. FEMALE FL. a pedicelled 3-celled ovary in the centre of the involucre, often protruding and recurved. *Styles* 3, free or connate, usually 2-fid. *Capsule* of three 2-valved cocci.

Analysis of the Species.

- | | |
|--|-------------------------|
| Branches sub-cylindrical | 1. <i>E. Nivulia</i> . |
| Branches with 5-7 prominent angles | 2. <i>E. Royleana</i> . |

1. **E. Nivulia**, Ham. ; Fl. Br. Ind. v. 255 ; Brandis For. Flora 439, Ind. Trees 558 ; Gamble Man. Ind. Timb. 590. Vern. *Thor*, *Thuor*, Dún ; *Súru*, Jaunsar ; *Señhúr*, Hind.

A large shrub or small tree ; branches in whorls of 4, fleshy, nearly cylindrical, with vertically or spirally arranged tubercles each supporting a pair of stipular prickles. *Leaves* alternate, 6-12 in. long, obovate-oblong or linear ; tip rounded ; midrib much elevated beneath ; lateral nerves indistinct. *Involucres* 3 together, central sessile male. lateral pedunculate with only male or both male and female flowers ; lobes fimbriate, erect, ovate ; bracteoles many. *Capsule* .3 in. diam. ; seeds smooth.

Dry rocky hills in the OUTER HIMALAYA and TEHRI-GARHWAL ; rather rare. Cultivated at DEHRA.

Leafless in cold and dry seasons. Fl. Mar., April. Fr. May.

2. **E. Royleana**, Boiss. ; Fl. Br. Ind. v. 257 ; Brandis For. Flora 438 ; Ind. Trees 559 ; Gamble Man. Ind. Timb. 591. Vern. *Thor*, *Thuor*, Dún ; *Súru*, Jaunsar ; *Señhúr* Hind.

A large milky shrub with thick fleshy 5-7-gonous branches : ridges wavy with a pair of stipular prickles at the crest of each wave. *Leaves* alternate, sessile, 4-6 in. long, spatulate, very shortly mucronate, fleshy lateral nerves 6-8 pairs, irregularly reticulate, quite indistinct until dry. *Involucres* hemispheric, about .5 in. across, greenish-yellow, 3-4 together in axillary subsessile clusters ; lobes fimbriate. *Styles* combined up to the middle. *Capsule* .6 in. diam., 3-gonous ; peduncles up to .5 in. long.

OUTER HIMALAYA and valleys in JAUNSAAR and TEHRIGARHWAL, up to 5,000 ft. : Málköt, Kálsi, Saiá, Tons Valley (Morághd), etc.

It grows readily from cuttings and is often planted in hedges.

Leafless throughout the cold and hot seasons. Fls. and Fr. Mar.-May.

E. acutis, Roxb. : Syn.—*E. fusiformis*, Buch-Ham. ; Fl. Br. Ind. v. 257. Vern. *Ban muli*. A dwarf unarmed glabrous perennial with a stout underground root-stock 6-20 in. long by 1.3 in. diameter ; aerial stem none. *Leaves* all radical 6-18 in. long by 1.5-3 in. broad, oblanceolate or obovate-oblong, obtuse or subacute, cuneate at the base, fleshy, glabrous on both surfaces. *Involucres* .25 in. diameter, 3-many-flowered, in dichotomous, peduncled cymes from the crown of the rootstock, appearing after the leaves have fallen ; *bracts* at the forks ovate-lanceolate, scarious, .3 in. long, upper smaller truncate and 3-fid. *Capsule* .3 in. diameter.

Dehra Dun and Saharanpur Siwaliks in Sal forest, i.e., Asarori, Shahjahanpur, etc. Fl. Hot season.

E. pulcherrima, Willd. : The Poinsettia.—An unarmed ornamental shrub with hollow branchlets and alternate, elliptic-ovate, acute, sinuate or shallowly-lobed leaves, about 6-8 in. long, and bright scarlet bracts surrounding the involucres. It is a native of America and is much grown in gardens for ornament. Fl. Cold season.

E. Bojeri, Hook. A small much-branched spiny shrub with alternate, spatulate mucronate leaves about .75-1.5 in. long and showy crimson flowers in dichotomous cymes. It is indigenous to Madagascar and is commonly cultivated in gardens under the name of *E. splendens*, Boj. Fl. Mar.-Oct.

2. *Sarcococca*, Lindl.

1. *S. saligna*, Muell. Agr. Syn.—*S. pruniformis*, Lindl. : Fl. Br. Ind. v. 266 ; Brandis Ind. Trees 565 ; Gamble Man. Ind. Timb. 592. Vern. *Tiliári*, Jaunsar.

A small evergreen shrub. *Leaves* variable, usually 1-3 in. long, elliptic or lanceolate, quite entire, coriaceous, glabrous, shining above, often 3-nerved at the base; lateral nerves faint. *Flowers* .3 in. diam., pale-yellow, monœcious, bracteate, in short axillary racemes. *Bracts* whitish, decussate. *Sepals* 4, imbricate, in two series, oblong, obtuse. *Stamens* 4, free, much longer than the sepals and opposite to them. *Ovary* 2-3 celled; ovules 2 in each cell; styles 2-3, at length recurved. *Fruit* drupaceous, .3-4 in. long, ovoid, purple when ripe.

JAUNSAAR and TEHRI-GARHWAL, 5,000 ft., generally gregarious in shady places.

Wood white, close-grained, moderately hard, sometimes used for walking sticks.

Fl. Mar.-May. Fr. June-Aug.

3. *Buxus*, Linn.

1. *B. Wallichiana*, Baill. Syn.—*B. sempervirens*, L. ex parte. Fl. Br. Ind. v. 267; Brandis For. Flora 447, Ind. Trees 559; Gamble Man. Ind. Timb. 592. The Box. Vern. *Pápri*, *Sansádu*. Jaunsar; *Chikri*, Punjab.

late, shining, glabrous. *Flowers* short. *Flowers* apetalous, monœcious, sessile, bracteate, in short congested axillary spikes. *Disk* 0. MALE FLS.: *Sepals* 2 pairs, one inside the other and imbricating with it, yellowish. *Stamens* 4, free, opposite the sepals, exserted. FEMALE FLS.: *Sepals* 6, in two or three series, the outer smallest, all imbricate, yellowish. *Ovary* 3-celled, with 2 ovules in each cell; styles 3, simple, exserted. *Consule* .5 in. long, ovoid

having two ...
testa and a fleshy albumen.

Jádi and Mátkángá Blocks in the Deoban Range, JAUNSAAR, and in the Jumna Valley, TEHRI-GARHWAL, always in shady rocky ravines.

Boxwood is yellowish-white, hard, very close- and even-grained. Pores very small, medullary rays extremely fine, both very numerous. Annual rings distinct but narrow, the growth being very slow. Weight about 60 lbs. per c. ft. It is the nearest approach to ivory and is used for engraving, turning, carving and

mathematical instruments. In India, however, it is chiefly carved into combs and various other articles, the principal market being Amritsar in the Punjab.

Fl. Mar.-May. Fr. June-Aug.

4. *Bridelia*, Willd.

Trees or shrubs, sometimes climbing. *Leaves* alternate, entire, with prominent lateral nerves. *Flowers* monœcious or diœcious, small, bracteate, in axillary sessile (rarely spicate) clusters. *Calyx* 4-5-cleft; lobes valvate. *Petals* 5, alternating with, and smaller than, the calyx-lobes. **MALE FLS.**: *Stamens* 5, united below in a column in the centre of a flat sinuate disk. **FEMALE FLS.**: *Ovary* 2- rarely 3-celled, on a cup-shaped membranous disk which is variously lobed. *Styles* 2, bifid. *Fruit* a soft drupe with 2 (or 1) usually indehiscent 1-seeded pyrenes.

Analysis of the Species.

- | | |
|---|--------------------------|
| A large tree; leaves rigidly coriaceous, with straight nerves; bracteoles few, coriaceous; calyx enlarged in fruit | 1. <i>B. retusa</i> . |
| A small tree; leaves membranous, with more or less arcuate nerves; bracteoles numerous, membranous; calyx not enlarged in fruit | 2. <i>B. verrucosa</i> . |

1. ***B. retusa***, Spreng.; Fl. Br. Ind. v. 268; Brandis For. Flora 449, Ind. Trees 560; Gamble Man. Ind. Timb. 595. Vern. *Ekdáníá*, *Gondni*, *Saháranpur*, *Gáyá*, *Khájá*, *Dún* and *Garhwal*.

A large or middle-sized deciduous tree, with strong spines when young; bark thin, grey or brownish-black. *Leaves* very variable, 3-6 in. long, obovate elliptic oblong or ovate, rigidly coriaceous, glabrous above, glabrous or glaucous beneath; lateral nerves 15-22 pairs, strong, straight, parallel; petiole .2-.5 in. long; stipules deciduous. *Flowers* diœcious, yellow, small, subsessile; bracts villous. *Calyx* .2 in. diam.; lobes ovate, *Petals* fleshy. *Fruit*

·3 in. diam., globose, green, purplish-black when ripe, supported by the somewhat enlarged calyx; pyrene generally solitary.

Throughout the DEHRA and SAHARANPUR DIVISIONS, especially in the moister parts; often associated with Sál.

Sapwood yellowish-white; heartwood grey or olive-brown, hard, compact, even- and close-grained, seasons well; annual rings distinct; weight about 50 lbs. per c. ft. The wood is used for carts, agricultural implements and building, also for drums in the Kheri District. It stands well under water and might be used for well-curbs. The bark is used for tanning; the ripe fruit is sweetish and is eaten, and the leaves are used as cattle-fodder.

New leaves May-June. Fl. May-July. Fr. Oct.-Jan.

2. **B. verrucosa**, Haines; Syn. *B. montana* (ex. synonym.); Brandis For. Flora 450, Ind. Trees 560; Gamble Man. Ind. Timb. 596. Fl. Br. Ind. v. 269 in part (forma 2) non Willd. Vern. *Gondni*, Saháranpur.

A small or moderate-sized deciduous tree, often only a shrub, with a short trunk and a low spreading crown; bark dark-grey; branchlets warted. Leaves very variable, 3-6 in. long, obovate or broad-elliptic, glabrous or shining above, paler beneath; lateral nerves 10-15 pairs, more or less arched; petiole ·1-·3 in. long; stipules deciduous. Flowers monœcious small, greenish-yellow, shortly pedicelled; bracts many and crowded, membranous, pubescent. Calyx ·1-·2 in. diam.; lobes triangular-ovate, unaltered in fruit. Petals oblanceolate. Fruit ovoid, ·2 in. long, black when ripe.

Fairly common in ravines or banks of ráus, up to 3,500 ft., especially in the SIWALIKS. Wood mottled, otherwise very similar to that of the last species, and might be used for the same purposes to the extent its smaller size would allow; weight 46-59 lbs. per c. ft. The leaves are lopped for fodder, but the fruits are not eaten.

Fl. Nov.-April. Fr. Nov.-April.

5. *Andrachne*, Linn.

A. cordifolia, Muell. Arg.; Fl. Br. Ind. v. 283; Brandis Ind. Trees 562. Vern. *Bharti*, *Bhartoi*, Jaunsar.

A small shrub 2-4 ft. high with slender, branches. Leaves alternate, 1-3·5 in. long by ·5-1·5 in. broad, ovate-oblong, obtuse, entire, thin, rounded at the base, glabrous above, pale and thinly pubescent beneath, especially on the nerves; petiole slender ·3-1 in. long. Flowers green, monœcious, axillary, solitary or several together; pedicels filiform, variable in length, ·5-1·5 in. long. Male

flowers : *Calyx* 5-partite, hairy outside ; segments obovate ; *petals* 5, spathulate, shorter than the calyx-segments ; disk 10-lobed conspicuous ; *stamens* 5, free, surrounding a small rudimentary pistil. *Female flowers* : *Calyx* as in the male, accrescent in fruit ; *petals* reduced to small glands ; *disk* a fleshy ring surrounding the base of the globose ovary ; *ovary* 3-celled ; *ovules* 2 in each cell ; *styles* 3, deeply divided into 2 long branches. *Capsule* globose, .3 in. diameter, supported by the enlarged calyx, 6-valved.

JAUNSAK and TEHRI-GARHWAL up to 8,000 ft. Rispana valley ; Arnigarh ; Mussoorie ; Mundali ; Konain ; Deota : etc.

Fl. Rainy season.

6. *Phyllanthus*, Linn.

Herbs, shrubs or trees. *Leaves* alternate, distichous, the branchlets resembling pinnate leaves ; *stipules* narrow or none. *Flowers* small, monœcious, axillary or on the old wood. *Sepals* 4-6, free or shortly connate, imbricate, more or less 2-seriate. *Petals* 0. *Male flowers* : *disk* glandular, rarely none. *Stamens* 3, rarely 4 or 5, central ; *filaments* free or connate ; *anthers* 2-celled ; *pistillode* none. *Female flowers* : *disk* of glands or annular ; *ovary* usually 3-celled ; *styles* free or connate, usually 2-fid ; *ovules* 2 in each cell. *Fruit* usually a capsule with 3 crustaceous or coriaceous 2-valved cocci, sometimes a berry or a drupe with a 3-4-celled stone.

Analysis of the Species.

Fruit succulent ; flowers in dense clusters ; a tree

2. *P. Emblica*.

Fruit capsular ; flowers solitary or 2-3

together ; a small shrub 1. *P. parvifolius*.

1. *P. parvifolius*, Buch-Ham. ; Fl. Br. Ind. v. 294 ; Brandis Ind. Trees 571.

A small shrub 1-4 ft. high ; stems often prostrate ; branchlets slender, minutely pubescent. *Leaves* .2-4 in. long by .15-25 in.

broad, obovate or elliptic-oblong, entire, glabrous, glaucous beneath; *petioles* minute; *stipules* hastate, finely acuminate. *Flowers* minute, brown purple, solitary or 2-3 together in the leaf-axils; *pedicels* about .1 in. long. Male flowers: *Stamens* 3; *filaments* free; *disk* of glands. Female flowers: *disk* annular, undulate, surrounding the base of the ovary; *ovary* 3-celled; *styles* 3, deeply 2-fid. *Capsule* depressed globose, .15 in. diameter, obscurely lobed, dull black when ripe.

Mussoorie, Jaunsar and Tehri-Garhwal on rocks, 4-7,000 ft., i.e., Arnigadh; Mussoorie; Bok Hill; Khatawa.

Fl. Sept.-Oct.

2. **P. Emblica**, Linn.; Fl. Br. Ind. v. 289; Brandis For. Flora 454, Ind. Trees 570; Gamble Man. Ind. Timb. 599. Vern. *Aoulá*, *Amlá*, *Aola*, Hind.

A moderate-sized deciduous tree; bark grey exfoliating in irregular patches, red inside; branchlets finely pubescent. *Leaves* .3-.5 in. long, subsessile, linear-oblong, acute or mucronate, distichously close-set on deciduous branchlets, together having the appearance of pinnate leaves; *stipules* minute. *Flowers* apetalous, monœcious, greenish-yellow, in axillary clusters. MALE FLS.: numerous and shortly pedicellate. *Stamens* 3, joined in a short column. *Disk* of distinct glands, alternating with the calyx-segments, rarely 0. FEMALE FLS.: *Sepals* as in the male flowers. *Ovary* 3-celled, with 2 ovules in each cell; *styles* 3, connate at the base, twice bifid. *Fruit* of three 2-valved cocci, .5-.7 in. diam., obscurely 6-lobed, globose, fleshy, pale-yellow, dehiscent only when dry.

Throughout the DEHRA and SAHARANPUR DIVISIONS, and up to 4,500 ft. in JAUNSAAR and TEHRI-GARHWAL; very common.

Wood red, hard and close-grained, but warps and splits in seasoning; it is, however, durable under water, and yields charcoal of excellent quality. Heartwood and annual rings not distinct; weight about 50 lbs. per c. ft. The bark and fruit are used in medicine and also for tanning. The fruit is eaten raw or pickled, and is believed to be good for chronic billiousness.

Leafless Feb.-April. Fl. Mar.-May. Fr. Cold season.

7. **Glochidion**, Forst.

(Placed under *Phyllanthus* in the "Genera Plantarum.")

Evergreen trees or shrubs. *Leaves* alternate, bifarious, entire. *Flowers* usually monœcious, apetalous,

small. MALE FLS. : *Sepals* 6, imbricate, in two series. *Anthers* 3-8, connate into a column ; connectives produced. *Disk* without glands. FEMALE FLS. : *Calyx* of 5-6 free or connate sepals. *Ovary* 3-15-celled ; ovules two in each cell. *Styles* variously united in a column. *Fruit* of 3 or more 2-valved cocci, quite globular or depressed, generally more or less lobed. *Seeds* hemispherical, albuminous.

Analysis of the Species.

Glabrous tree ; branchlets angular ; fruit only slightly depressed, .25 in. diameter. 2. *G. assamicum*.
Tomentose tree ; branchlets terete ; fruit much depressed, .3-.5 in. diameter . 1. *G. velutinum*.

1. ***G. velutinum***, Wight ; Fl. Br. Ind. v. 322. Brandis Ind. Trees 574 ; Gamble Man. Ind. Timb. 602. Syn.—*Phyllanthus nepalensis*, Muell. Arg. ; Brandis For. Flora 452. Vern. *Anwin*, Jaunsar ; *Chamari*, Dún ; *Kath Mauuá*, Garhwal.

A small tree, tomentose throughout. *Leaves* 2-5 in. long, ovate elliptic or oblong, rather coriaceous, glabrate above ; lateral nerves 4-6 pairs ; base rounded or obtuse ; petiole .1-.15 in. long ; stipules subulate. *Flowers* in axillary fascicles,—the male on long slender pedicels ; the female subsessile. *Calyx* of 6 segments, hairy outside. MALE FLS. : *Anthers* 3, oblong ; connective prolonged. FEMALE FLS. densely clustered. *Styles* connate into a cylindrical column. *Capsule* .3-.5 in. diam., depressed, usually 4-celled and deeply 8-lobed.

Common in the DÚN and SAHÁRANPUR FORESTS, also in low valleys (Tons. etc.) in JAUN SAR and TEHRI-GAHRHWAL.

Wood brownish-white, compact. The bark is used for tanning.

Fl. Feb.-April. Fr. June-Aug.

2. ***G. assamicum***, Hook. f. ; Fl. Br. Ind. v. 319 ; Brandis Ind. Trees 575.

A small glabrous tree with angular branchlets ; bark grey, wrinkled. *Leaves* 3-6 in. long by 1.25-2.25 in. broad, elliptic or elliptic-oblong, acuminate subcoriaceous, entire, base acute or

rounded, oblique, dark green, glabrous and glossy above, pale and somewhat glossy beneath, often blotched with purple; *petiole* .1-.15 in. long; *stipules* subulate from a triangular base. *Flowers* pale green, in axillary fascicles, males long pedicelled, females sessile or subsessile, often very numerous. *Male flowers*: pedicels capillary, .3-.5 in. long, glabrous; *sepals* 6, about .08 long; *anthers* 3, connate, with connectives terminating in an umbo. *Female flowers*: *sepals* 6, minute; *ovary* sessile, glabrous; *style* conical, short, glabrous, obscurely 8-grooved. *Capsule* .25 in. diameter, nearly sessile, densely clustered in axils along the branchlets, indistinctly 4-lobed, glabrous.

Fairly common in moist localities in the Dún, Dehra Dun; Kansrao; Nakraunda; etc.

Fl. Mar.-May.

8. *Flueggea*, Willd.

1. *F. microcarpa*, Bl.; Fl. Br. Ind. v. 328; Brandis Ind. Trees 569; Gamble Man. Ind. Timb. 603. Syn.—*Securinega obovata*, Muell. Arg.; Brandis For. Flora 455. Vern. *Rithoul*. Dún.

A small tree with rusty or reddish-brown thin bark and angular branchlets marked with small white specks; branches straight and regularly fluted. *Leaves* very variable, 1-4 in. long, elliptic ovate obovate or orbicular, membranous but tough, rather glaucous beneath; tip rounded obtuse or acute, rarely acuminate or retuse; lateral nerves 6-8 pairs, very slender; *petiole* .1-.3 in. long, slender. *Flowers* dioecious, very small, apetalous pedicelled, usually in axillary fascicles. *Sepals* 5, imbricate. MALE FLS.: *Stamens* 5, alternating with disk-glands but opposite to the sepals; pistillode large, 3-fid. FEMALE FLS.: *Ovary* on an annular disk: styles 3, 2-fid., recurved. *Fruit* of two sizes, mostly small and dry, about .1-.15 in. diam., with a few larger ones, .3 in. diam., which are white and fleshy; seeds 3-6, punctate.

Very common along the foot of the SIWALIKS in the SAHÁRANPUR DISTRICT, especially towards the west, and generally in scrub forests in the Dún; Sháhjahánpur, Kasúmri, Barkálá; Lachiwála, Gulargháti, Káunli, etc.

Wood reddish-white, close-grained, strong and durable, used for agricultural implements; weight 52 lbs. per c. ft. The branches make handsome walking-sticks, and are much used for the framework of thatched roofs as a substitute for bamboos. The bark is astringent, and is used to intoxicate fish.

Fl. Apr.-May. Fr. Sept.-Nov.

9. *Putranjiva*, Wall.

1. *P. Roxburghii*, Wall.; Fl. Br. Ind. v. 336; Brandis For. Flora 451, Ind. Trees 566; Gamble Man. Ind. Timb. 604. Vern. *Jiápútá*, *Pútijá*, Hind.

A handsome evergreen tree generally with pendent branches; branchlets slender, pubescent; bark dark-grey, almost smooth, marked with horizontal lines of white specks. *Leaves* alternate, 2-4 in. long, elliptic-oblong, acute or acuminate, serrulate, rarely entire, glabrous, shining, dark-green; main lateral nerves 8-10 pairs besides secondary nerves and reticulate veins; petiole .2-3 in. long, pubescent; stipules subulate, deciduous. *Flowers* dioecious, small, yellow; MALE short-pedicelled in axillary clusters which are often spicate; FEMALE long-pedicelled, axillary, solitary or in twos or threes. *Calyx* 3-5-cleft; segments imbricate. *Stamens* 3; filaments more or less connate. *Ovary* tomentose, 3-celled; styles 3; stigmas crescent-shaped. *Fruit* a drupe, .5 in. long, obovoid or globose, white-tomentose; putamen very hard.

In moist shady mixed forests in the DUN and SAHARANPUR DIVISIONS, especially on the banks of the Suswá below Kánsráu; Khairi swamp, Rikhiresh, Gularparáo; Barkálá, Kasá-mri, etc.

Wood light-grey, even-grained, shining, moderately hard, fairly durable; weight 50 lbs. per c. ft. Used for tools and turning. The leaves are used for cattle-fodder, and the nuts are strung up in rosaries and tied round children's neck to keep off disease, and also worn by women during pregnancy to prevent abortion.

New leaves in Apr. Fl. Apr., May. Fr. Cold season.

10. *Cyclostemon*, Bl.

1. *C. assamicus*, Hook. f.; Fl. Br. Ind. v. 342; Brandis Ind. Trees 567; Gamble Man. Ind. Timb. 607. Vern. *Chipla*, Dún; *Khadbehúlá*, Kumaun.

A very handsome small evergreen tree with smooth greenish-grey thin bark and slender branchlets. *Leaves* 3-5 in. long, ovate or elliptic-oblong, dark-green, quite glabrous and shining; margins entire but undulate; nerves 10-12 pairs, slender; petiole .2-3 in. *Flowers* axillary, dioecious, apetalous, shortly pedicellate. *Sepals* usually 4, imbricate. MALE FLS.: *Stamens* about 12; filaments free. FEM. FLS.: *Ovary* generally 2-celled; stigmas sessile, fleshy, spreading, light-brown, liable to get chipped off in drying. *Fruit* a drupe .5 in. diam., brownish-grey-tomentose and chartaceous when young, but more or less distinctly lobed and bright scarlet when ripe; putamen hard, black; seeds albuminous.

Found in the Nakraunda and Mothronwála swamps, 1,900 ft., in the DÚN.

The wood is greyish-white, moderately heavy, hard, tough and even-grained, with distinct rings : no heartwood. The leaves are eaten by cattle. The ripe fruit has a sweet mesocarp and is much eaten in Assam.

Fl. Nov., Dec. Fr. from Jan., probably ripening, as in Assam, in April.

11. *Bischoffia*, Blume.

1. *B. javanica*, Bl. ; Fl. Br. Ind. v. 345 ; Brandis For. Flora 446, Ind. Trees 558 ; Gamble Man. Ind. Timb. 607. Vern. *Páni-ala*, Western DÚN : *Bhillár*, Málkôt ; *Kot Smlá*, Káen, Garhwal.

A large diœcious tree with a dark-brown bark exfoliating in angular scales. *Leaves* alternate, 3-foliate, variable in size ; common petiole 2-6 in. long. *Leaflets* 3-5, 1.5-3 in., ovate or ovate-oblong, acuminate, crenate : petiolule of lateral leaflets about .5 in. long. *Inflorescence* a much-branched terminal panicle. MALE FLS. minute ; *sepals* 5, concave, obtuse, enclosing the stamens and opposite to them. FEMALE FLS. .2 in. diam. : *sepals* ovate, caducous. *Ovary* exserted, 3-celled, with two ovules in each cell ; styles long, entire. *Fruit* a globose berry .5 in. diam., brown when fully ripe, supported on the thickened pedicels.

Shady ravines and in swampy localities in the DÚN and OUTER HIMALAYA : Karwápáni, Lachiwála, Nakraunda, Khairi swamp, Káluwála, Sansáru khála, Málkôt Hills, etc.

Wood red, moderately hard, but rough-grained ; heartwood of a darker colour, small. Weight 40-50 lbs. per c. ft. Little known in the DÚN, but is used for all kinds of construction and for boat-building in other parts of India, notably in Eastern Bengal and Assam where it is also used for railway sleepers.

New leaves Feb., Mar. Fl. Apr., May. Fr. Cold season.

12. *Daphniphyllum*, Bl.

1. *D. himalayense*, Muell. Arg. ; Fl. Br. Ind. v. 354 ; Brandis Ind. Trees 566 ; Gamble Man. Ind. Timb. 609. Vern. *Ratendú*, Jaunsar.

A small tree with stout trunk and branches. *Leaves* alternate, 6-8 in. long, linear-oblong or oblong-lanceolate, acute or acuminate, entire, glabrous and shining above, glaucous beneath ; petiole 1.5-2 in. long. *Flowers* diœcious, apetalous, in 3-4 in. long axillary

racemes. *Sepals* 3-8, small, deciduous in the female fl. *Stamens* 5; anthers apiculate. *Ovary* imperfectly 2-celled, cells 2-ovuled; styles short or stigmas sessile, distinct, recurved. *Fruit* an oblong drupe, .5-6 in. long; seed with a membranous testa, albuminous.

Found in shady ravines at and near MUSSOORIE, and in the OUTER HIMALAYAS, e.g., Málköt. Also in JAUNSAIR, 5,-7,000 ft.; Dárná, Mátkángará, Baináná, etc.

Wood pale-brown, fine-and-close-grained: pores minute; medullary rays numerous and fine; weight about 40 lbs. per c. ft.; wood of the roots is of a deep red colour and capable of being used for ornamental purposes.

Fl. Mar., Apr. Fr. June-Aug.

13. *Antidesma*, Linn.

1. *A. diandrum*, Roth; Fl. Br. Ind. v. 361; Brandis For. Flora 447, Ind. Trees 565; Gamble Man. Ind. Timb. 610. Vern. *Amli*, *Imli*, *Káli Khatái*, Dún.

A large deciduous shrub with smooth grey bark and low spreading crown; branchlets rusty-tomentose. *Leaves* alternate, 2-5 by 1-2 in., ovate-oblong or ovate-lanceolate, acute or acuminate, quite entire, glabrous and shining above, turning deep-red before falling; nerves faint, rusty-pubescent beneath; petiole 1 in., pubescent; stipules lanceolate. *Flowers* dioecious, apetalous, greenish-yellow, very small, in slender terminal racemes. *Calyx* cup-shaped, 5-toothed. *Stamens* generally two, filaments free, as long as the pedicels; disk lobed. *Ovary* 1-celled; stigma bifid. *Fruit* a sub-globose drupe, .2 in. diam., of a pleasant acid taste and purplish-red when ripe.

Fairly common in Sál forests and on the outskirts of *tappars* in the DÚN, up to 2,500 ft.; less so in the SAHÁRANPUR DISTRICT.

Wood pinkish-grey, hard, close-grained, weighing 41 lbs. per c. ft. The acid leaves are greedily eaten by coolies when thirsty, and are made into *chutni*. The fruit also is eaten.

New leaves Apr., May. Fl. May, June. Fr. Dec., Jan.

14. *Jatropha*, Linn.

1. *J. Curcas*, Linn.; Fl. Br. Ind. v. 383; Brandis Ind. Trees 576; Gamble Man. Ind. Timb. 613. Vern. *Safed Arand*, Hind.

A shrub or small tree with a short irregular trunk; young shoots glandular-tomentose, with an opaque saponaceous juice; bark grey, smooth, peeling off in thin papery flakes. *Leaves* 4-6 by 3-5 in., broadly cordate, usually palmately 5-lobed; petiole 3-9 in. long. *Flowers* yellowish, monœcious, in terminal or sub-terminal cymes. *Sepals* 5, imbricate, slightly puberulous, often coloured. *Corolla* tubular, pale-yellow, villous within; limb 5-lobed. *Stamens* 10, in two series; filaments of the inner series connate. *Ovary* 3-celled. *Styles* 3, glabrous. *Fruit* about .75-1 in. long, 3-lobed, oblong; seeds oblong, large, dark-brown, smooth; albumen oily.

Planted in hedge-rows in the DŪN and SÁHÁRANPUR DISTRICTS and often growing wild as an escape. The juice of the twigs gives a soapy lather, believed to do good if applied on sores. The oil of the seeds is medicinal.

Fl. and Fr. throughout the year.

15. *Trewia*, Linn.

1. *T. nudiflora*, Linn.; Fl. Br. Ind. v. 423; Brandis For. Flora 443, Ind. Trees 590; Gamble Man. Ind. Timb. 617. Vern. *Gamhár* (which is also the name for *Gmelina arborea*), *Túmri*, Dún; *Dhaul-peddá* (white tree), Sáháranpur.

A middle-sized deciduous tree with smooth grey bark. *Leaves* 6-9 by 4.5-7 in., cordate or broad-ovate, glabrous, 3-5 nerved at the base; petiole 2-4 in. long, terete. *Flowers* pale-green, in axillary racemes, appearing before the leaves: MALE in fascicles of 3-4, each supported by a bract, in lax interrupted racemes 4-9 in. long; FEMALE long-pedicellate, solitary or in few-flowered racemes. *Calyx* in the MALE FLS. globose, splitting into 3-4 concave segments; in the FEMALE FLS. of 3-5 imbricate sepals. *Disk* 0. *Stamens* free, numerous. *Ovary* cottony, 3-4-celled, cells 1-ovuled; styles connate at the base, about 1 in. long, covered with papillose stigmas throughout. *Fruit* a berry, 1-1.3 in. diam. globose, depressed, smooth mesocarp not harder than potato.

Damp places and ravines in the DŪN; Lachi-wála, Nakraunda, Kálúwála, banks of the Jumná, Kánsráu and other Passes, etc.

Wood white, soft, fairly elastic, but not durable; weight 28-29 lbs. per c. ft. Used for country-made drums, and for yokes in Western Bengal.

Leafless Jan.-Mar. New leaves Mar., Apr. Fl. Feb.-Apl. Fr. Cold season.

16. *Mallotus*, Lour.

1. *M. philippinensis*, Muell. Arg. : Fl. Br. Ind. v. 442 ; Brandis For. Flora 444, Ind. Trees 590 ; Gamble Man. Ind. Timb. 619. Vern. *Rāini*, Dún ; *Kambel*, Jaunsar ; *Rohni*, *Roini*, Garhwal.

Generally a small evergreen tree, but occasionally up to 50 ft. high and 5 ft. in girth : bark thin, dark-grey, somewhat rough ; young branches rusty. *Leaves* alternate, simple, very variable both in size and shape, usually 3-9 in. long, ovate, ovate-oblong or lanceolate, entire or, if of luxuriant coppice-shoots, closely toothed, glabrous above, pubescent and with close-set red glands beneath, 3-nerved at the base : petiole about half the length of the blade, rusty-pubescent. *Inflorescence* and *flowers* brown or brick-red. *Calyx* 3-cleft. *Petals* and *disk* none. MALE FLS. clustered, anther-cells distinct and globose. FEMALE FLS. solitary. *Ovary* 3-celled : cells 1-ovuled : styles 3, papillose inside. *Fruit* a 3-lobed capsule, .3-.5 in. diam., covered with a crimson powder when ripe ; seeds about .1 in. diam., globose, smooth, black.

Extremely common in the DÚN and SAHÁRANPUR FORESTS and also up to 4,000 ft. in JAUNSAAR and TEHRI-GARHWAL.

Wood smooth, hard and close-grained ; sapwood white ; heartwood light-red to darker red towards the centre in large stems ; used chiefly as fuel. Annual rings indistinct ; weight 48 lbs. per c. ft. The bark is sometimes used for tanning. The crimson powder, *kamelá*, which covers the ripe fruit, is used for dyeing silk, and also in medicine and Hindu religious ceremonies. The tree coppices exceedingly well.

Fl. Sept.-Nov. Fr. Mar.-May.

17. *Macaranga*, Thouars.

1. *M. indica*, Wight : Fl. Br. Ind. v. 446 ; Brandis Ind. Trees 592 ; Gamble Man. Ind. Timb. 621. Vern. *Pápri*, Málkôt ; *Rámálo*, Kumaun.

A middle-sized tree with thick glaucous branches and grey smooth bark. *Leaves* alternate, 6-12 by 5-10 in., deltoid-ovate, peltate, acuminate, entire or very obscurely and distantly toothed, thinly coriaceous, glabrate and closely yellow-punctate beneath ; base rounded or truncate with two glands above ; lateral nerves about 10 pairs above the petiole, the basal pair penniveined ; petiole 4-12 in. long, glaucous ; stipules .5 long, ovate, acuminate, recurved. *Flowers* dioecious, in axillary paniced racemes ; bracts broad, concave. *Stamens* 6-8 ; anthers 4-celled. *Ovary* 1-celled. *Style*.

very short; stigma spurred. *Capsule* very small, covered with resinous points, crowned with the obliquely placed spurred stigma; seeds globose.

Only found in the Málkôt Hills, DEHRA DÚN, 4,500 ft.; Sansarú and Láswáni Khálás.

Wood greyish-red, rather soft; pores large; medullary rays very fine, numerous: weight 33 lbs. per c. ft. (Growth very fast.

Fl. Aug., Sept. Fr. Nov., Dec.

18. *Bali ospermum*, Blume.

B. montanum, Muell. Syn. *B. axillare*, Bl.; Fl. Br. Ind. v. 461; Brandis Ind. Trees 583 Gamble Man. Ind. Timb. 624. Vern. *Dante*.

A stout undershrub 3-6 ft. high; young shoots pubescent. *Leaves* alternate, very variable in shape and size, upper lanceolate; penni-nerved, 2-3 in. long, lower ovate, 6-10 in. long, often palmately 3-5 lobed, firmly coriaceous, acute or acuminate, sinuate-toothed, base rounded, subcordate or cuneate, 3-5 nerved, pubescent beneath when young, more or less glabrous when mature; *petiole* 2-6 in. long; *stipules* of 2 glands. *Flowers* small, monœcious, greenish, in short interrupted racemes from the axils of upper leaves; *pedicels* 1-15 in. long, clustered. *Male-flowers*; *Calyx* 1 in. long, 4-5-partite, membranous, segments orbicular, concave; *petals* 0, *disk* of 6 glands; *stamens* 15-20: *anther-cells* adnate to a broad connective. *Female flowers*; *sepals* 5, ovate pubescent not accrescent, *petals* 0; *disk* cupular, thin; *ovary* 3-celled, hairy; *ovule* 1 in each cell; *style* stout, 2-partite, dull red. *Capsule* 3-5 in. long, 3-lobed, slightly pubescent.

Fairly common in shady localities in the Dun; Bindal Nala; Lachiwala, Khairi; etc.

Various parts of the plant are used in medicine.

Fl. and Fr. throughout the year.

19. *Ricinus*, Linn.

R. communis, Linn; Fl. Br. Ind. v. 457; Brandis Ind. Trees 593. Vern. *Erandi*, *Arandi*, Hind. The Castor-Oil plant.

An evergreen shrub or occasionally a soft-wooded small tree; stem hollow. *Leaves* alternate, 9-18 in. diameter, peltate, palmately lobed, membranous, irregularly serrate, glaucous beneath,

petiole hollow, about as long as the blade; *stipules* caducous. Flowers monœcious, in terminal subpaniculate racemes, the upper as a rule female, the lower male. *Male flowers*; *calyx* membranous, 3-5 partite, lobes valvate; *petals* 0; *stamens* numerous, filaments connate and repeatedly branched, anther-cells distinct, divergent, sub-globose; *pistillode* none. *Female flowers*; *calyx* spathaceous, caducous; *ovary* 3-celled; *ovules* 1 in each cell; *styles* 2-fid, spreading, feathery. *Fruit* a globose capsule, generally echinate, .5-1 in. long breaking into 3, two-valved cocci; *seeds* oblong, mottled, smooth with a white caruncle.

Cultivated and run wild in various parts of the area near villages. It is probably a native of Africa.

The Eri silkworm is reared on its leaves. Besides the well known oil, many parts of the plant are used in medicine.

Fl. greater part of the year.

20. *Sapium*, P. Br.

Trees or shrubs. *Leaves* alternate, entire or toothed; petiole often with two glands at the top. *Flowers* in terminal racemes or spikes, monœcious apetalous: MALES several in each bract; FEMALES at the base of the same racemes with male flower or in separate spikes, each in a bract. *Disk* none. *Calyx* 2-3-lobed or toothed or split to the base: sepals valvate. *Stamens* 2-3, filaments free; anther-cells distinct. *Ovary* 2-3-celled, with 1 ovule in each cell. *Styles* as many as the carpels, more or less connate at the base, undivided, spreading, stigmatose inside. *Fruit* a tardily dehiscent 3-valved capsule. *Seeds* globose: albumen fleshy.

Analysis of the Species.

- Leaves rhomboid, entire; female flowers
at the base of racemes of male flowers 1. *S. sebiferum*.
Leaves oblong-lanceolate, crenate; female
flowers in separate spikes 2. *S. insigne*.

1. **S. sebiferum**, Roxb. : Fl. Br. Ind. v. 470 ; Brandis Ind. Trees 584 ; Gamble Man. Ind. Timb. 624. Syn.—*Excæcaria sebifera*. Muell. Arg. ; Brandis For. Flora 441. The Chinese Tallow-tree. Vern. *Tár-charbi*, Dún : *Pahári Shisham*, Saharanpur

A small gnarled tree. *Leaves* 2-3 in. long, rhomboid or broad-ovate, sometimes broader than long, acuminate, entire, membranous, glaucous beneath, somewhat resembling the leaflets of *Sissu* ; petiole flexible, nearly as long as the blade, with 2 glands at the top. *Flowers* greenish-yellow, monœcious, in terminal racemes 2-4 in. long ; FEMALE FLOWERS few, stoutly pedicelled, at the base of racemes bearing male flowers above, the male portion being caducous ; MALE FLOWERS at the end of racemes of the above kind, or forming racemes entirely of their own which appear generally before the female or androgynous racemes. *Calyx* truncate. *Anthers* 2-3, large, exserted. *Ovary* glabrous ; styles 3, connate at the base ; stigmas recurved. *Capsules* sub-globose, glaucous, .4-.5 in. diam. *Seeds* 3, enclosed in a white fatty arillus.

Growing wild everywhere in the DÛN, but less common in the SAHÁRANPUR DISTRICT. It is generally planted in avenues.

The wood is even-grained, light, soft or moderately hard ; weight 32 lbs. per c. ft. The tallow of the seeds is separated by boiling in water, and is made into candles in China and Japan, where the tree is indigenous. The seeds give an oil, and the leaves a black dye.

Leafless Feb.-Apr. Fl. June-Aug. Fr. Oct.-Dec.

2. **S. insigne**, Benth. : Fl. Br. Ind. v. 471 ; Brandis Ind. Trees 585 ; Gamble Man. Ind. Timb. 625. Syn.—*Excæcaria insignis*, Muell. Arg. ; Brandis For. Flora 442. Vern. *Khinná*, *Khindrá*, *Khinni*, *Khinni*, Dún and Garhwal.

A middle-sized deciduous tree with grey corky bark and thick milky juice. *Leaves* 6-12 in. long, elliptic or oblong-lanceolate, acuminate, crenate-serrate, soft, glabrous ; lateral nerves slender, 12-20 pairs ; petiole 1-2 in. long, with a pair of glands near the apex. *Flowers* in long fleshy terminal spikes ; MALE in circular clusters subtended by two fleshy ovate acute green bracts ; *calyx* membranous, lobes 2, rounded ; *stamens* 2. FEMALE shortly pedicelled ; *sepals* ovate ; *stigmas* short. *Fruit* an ovoid capsule .3 in. long, closely packed on a fleshy spike ; seeds with an oily albumen.

Foot of the HIMALAYA and hot valleys up to 4,000 ft. Common at Tháno, Kálímatti, Raipur, Sahansra-dhárá, Saiá, etc.

Wood white, very soft, spongy and very light, weighing about 25 lbs. per c. ft. It is used for cylinders of Indian drums. The

milk is acrid and is said to be poisonous. It is often planted in hedges.

Leafless Dec.-Apr. Fl. Cold season. Fr. May, June.

LXXVIII. URTICACEÆ.

Herbs, shrubs or trees, often with milky sap. *Leaves* usually alternate, simple, stipulate, generally stellately hirsute. *Flowers* mostly 1-sexual, monœcious or dioecious, small, in heads cymes or spikes or inside a hollow receptacle. *Perianth* simple, or of 3-5 free or connate segments. *Stamens* usually as many as perianth-segments and opposite to them, often inflexed in bud with reversed anthers. *Ovary* free, 1-celled, 1-ovuled; style simple or 2-fid, often eccentric; stigma armed or feathery. *Fruit* a samara, a drupe, a nut or an achene, the last often in variously shaped receptacles.

This Family may be divided into the following Tribes:—

- I. ULMEÆ.—Sap watery. Flowers 2-sexual; stamens not inflected; style 2-fid; ovule suspended; fruit a samara.—*Ulmus*, *Holoptelea*.
- II. CELTIDÆ.—Sap watery. Flowers polygamous; stamens not inflected in bud; style 2-fid; ovule suspended; fruit a drupe.—*Celtis*, *Trema*.
- III. MOREÆ.—Sap milky. Flowers 1-sexual, in spikes or heads; stamens inflected; style generally 2-fid; ovule suspended; fruit usually compound.—*Streblus*, *Morus*, *Broussonetia*.
- IV. ARTOCARPEÆ.—Sap milky. Flowers 1-sexual, inside or around a fleshy receptacle; stamens not inflected; style simple; ovule suspended; sap milky.—*Ficus*, *Cudrania*, *Artocarpus*.
- V. URTICÆÆ.—Sap watery. Flowers 1-sexual, usually in heads or clusters; stamens inflected; style simple; ovule erect; fruit a simple achene.—*Bæhmeria*, *Pouzolzia*, *Villebrunea*, *Debregeasia*, *Maoutia*, *Girardinia*.

*Analysis of the Genera.*I. *ULMEÆ.*

- Leaves serrate ; lateral nerves many,
straight ; wing of samara continuous . 1. *ULMUS.*
Leaves entire ; lateral nerves few, arcuate ;
wing of samara cleft at the tip . 2. *HOLOPTELEA.*

II. *CELTIDÆ.*

- Leaves 3-nerved, smooth ; male sepals
imbricate . 3. *CELTIS.*
Leaves 3-nerved, scabrous ; male sepals
valvate . 4. *TREMA.*

III. *MORÆ.*

- Fruit a syncarpium formed from a whole inflorescence.
Female flowers in globose heads ; ripe
carpels pendulous on long fleshy
stalks ; leaves often opposite . 6. *BROUSSONETIA.*
Female flowers in ovoid or cylindric
spikes ; ripe carpels not pendulous
on long stalks, leaves always alter-
nate . 7. *MORUS.*
Fruit formed from one flower only, leaves
rough ; male flowers in small globose
heads . 5. *STREBLUS.*

IV. *ARTOCARPEÆ.*

- Leaves penni- or 3-nerved ; fruit a hollow
receptacle with free achenes inside . 8. *FIGUS.*
Leaves penninerved ; fruit a many-seeded
compound berry . 9. *CUDRANIA.*

V. *URTICÆ.*

- Fruiting perianth dry or membranous.
Flower-heads in interrupted spikes . 10. *BÆHMERIA.*
Flower-heads in sessile axillary
clusters . 11. *POUZOLZIA.*
Fruiting perianth fleshy.
Leaves broad . 12. *VILLEBRUNEA.*
Leaves narrow . 13. *DEBREGEASIA.*
Fruiting perianth none ; flower-heads
cymose . 14. *MAOUTIA.*

I. ULMEÆ.

1. *Ulmus*, Linn.

1. *U. Wallichiana*, Planch. ; Fl. Br. Ind. v. 480 ; Brandis For. Flora 432, Ind. Trees 594 ; Gamble Man. Ind. Timb. 627. The Himalayan Elm. Vern. *Emroi*, *Imroi*, Jaunsar.

A large deciduous tree with rough grey bark exfoliating in diamond-shaped scales ; young branches pubescent. *Leaves* alternate, 2-6 in. long, elliptic-ovate or obovate, long-acuminate, doubly serrate, scarbrous or smooth above, pubescent beneath ; nerves 15-20 pairs, straight, each terminating in a large serrature, axils of nerves usually villous ; base unequal ; petiole .3-5 in. long ; stipules subulate, membranous. *Flowers* 2-sexual, in dense lateral racemes, appearing before the leaves from the leaf-scars of last year's shoots ; pedicels .2 in., fascicled, jointed a little below the middle, pubescent below the joint. *Perianth* turbinate, glabrous, persistent ; lobes 5-6, ciliate. *Stamens* as many as the perianth-lobes, not inflected in bud. *Ovary* compressed, stipitate ; style 2-fid, inner side stigmatose to the base. *Fruit* a flat stipitate samara, .6-7 in. long, with an ovate or obovate membranous reticulate wing completely surrounding the seed.

JAUNSAR and TEHRI-GARHWAL, between 3,500 and 10,000 ft., generally in ravines, fairly common ; Mohna Block, Konáin, Dharágádh, Bálehá, Kúlni, etc.

Heartwood greyish-brown, fine-grained, moderately hard, with a very beautiful silver-grain, capable of a fine polish. The bark contains a strong fibre which is made into cordage, sandals and slow-matches. The leaves are much prized as cattle-fodder, for which reason the tree is planted about villages.

New leaves Apr., May. Fl. Mar., Apr. Fr. May, June.

2. *Holoptelea*, Planch.

1. *H. integrifolia*, Planch. ; Fl. Br. Ind. v. 481 ; Brandis Ind. Trees 595, Gamble Man. Ind. Timb. 628. Syn.—*Ulmus integrifolia*, Roxb. ; Brandis For. Flora 431, Vern. *Pápri*, *Káli Pápri*, *Banchillá*, *Saháranpur*.

A large deciduous tree ; bark grey or light-brown, with an offensive smell when freshly cut, marked with tubercles on branches. *Leaves* alternate, 3-6 by 2-3 in., elliptic or broad-oblong, acuminate, entire, coriaceous, glabrous or pubescent beneath ; nerves 5-8 pairs ; areolate ; base rounded or acute, rarely cordate or oblique ; petiole

.2-3 in. long; stipules ovate, membranous. *Inflorescence* as in *Ulmus Wallichiana*; fascicles fewer-flowered. *Perianth* cleft to the base; segments pubescent. *Stamens* 8 in male fls., 5 in 2-sexual fls., anthers hairy. *Ovary* long-stipitate. *Fruit* an oval or orbicular samara 1 in. long, generally chartaceous, cleft at the tip, often crowned with the remains of the style.

Common throughout the SARÁRANPUR DISTRICT; also found in a few places in the DÛN, and at low elevations in JAUNSA, *e.g.*, Khairi swamp, Barkôt, Tháno, Kálimatti, Kálsi, etc.

Wood yellowish-grey, moderately hard; pores small and uniformly distributed; heartwood and annual rings not distinct; weight 40 lbs. per c. ft. The wood is used for building, carts and carving. The leaves, which have an unpleasant smell, are lopped for cattle-fodder. An oil can be extracted from the seeds.

Leafless Feb., Mar. Fl. while leafless, Fr. May-Aug., remaining long on the tree.

II. CELTIDEÆ.

3. *Celtis*, Linn.

Trees or shrubs. *Leaves* alternate, bifarious, usually oblique and 3-nerved at the base; *stipules* lateral, caducous. *Flowers* small, polygamous, solitary or cymose. *Perianth* 4-5-partite; segments imbricate. *Petals* none. *Stamens* 4-5, short, erect in bud. *Disk* hairy. *Ovary* sessile; *ovule* 1, pendulous; *style* arms 2, stout, plumose. *Fruit* a small ovoid or globose drupe; endocarp hard.

Analysis of the species.

- | | |
|---|--------------------------|
| Leaves coarsely serrate from near the base; drupes ellipsoid, purplish-black | 2. <i>C. australis</i> . |
| Leaves serrate from above the middle or subentire; drupes globose, orange-red | 1. <i>C. tetrandra</i> . |

1. *C. tetrandra*, Roxb.; Fl. Br. Ind. v. 482; Brandis Ind. Trees 596; Gamble Man. Ind. Timb. 344.

A large deciduous tree, bark smooth, grey, branchlets slender brownish, usually glabrous. *Leaves* alternate, 2.5-6 in. long by

1-2 in. broad, obliquely ovate-lanceolate, caudate-acuminate, serrate from above the middle, glabrous when mature except for tufts of hairs in the axils of secondary nerves, lateral nerves 3 pairs, the lowest pair basal; *petiole* .2-.5 in. long. *Flowers* small, polygamous, pale yellowish-green, in axillary or lateral cymes sometimes solitary; *peduncles* of female flowers .15-.3 in. long, those of the male flowers smaller, both very slender, glabrous. *Perianth-segments* usually 4, elliptic, .1 in. long, pubescent outside, fringed with woolly hairs on the margins. *Petals* none. *Stamens* usually 4. *Ovary* sessile on a hairy disk, pilose at the apex, 1-celled; *ovule* 1, pendulous; *style* arms 2, stout. *Drupe* .3 in. diameter, globose, orange-red when ripe; stone reticulately rugose, *peduncle* .5-.7 in. long.

Dehra Dun and Saharanpur forests, ascending to 6,000 ft. in Jaunsar and Tehri-Garhwal, i.e., Sabhawalla; Ramgarh; Phandowala; Pathri; Binalgadh; Thadiar; below Mundali, etc.

Fl. Feb.-Mar.

2. *C. australis*, Linn.; Syn.—*C. australis* ex parte; Fl. Br. Ind. v. 482; Brandis Flor. Flora 428, Ind. Trees 595; Gamble Man. Ind. Timb. 529. Vern. *Kharik*, *Kharak*, Jaunsar and Garhwal; *Kharak-chená*, Dón.

A middle-sized deciduous tree; bark bluish-grey or brown, often with whitish specks, larger trees with narrow horizontal wrinkles; branchlets drooping. *Leaves* alternate, 3-5 in. long by 1-3.25 in. broad, obliquely ovate or elliptic, long-acuminate, coarsely serrate from near the base, coriaceous and tough when full grown, dark-green and glabrous above, with 3 strong basal nerves, midrib penniveined; base acute or rounded, sometimes oblique; *petiole* .3-.7 in. long; *stipules* subulate, caducous. *Flowers* polygamous, 4-5 merous, male and 2-sexual on short capillary pedicels at the base of the shoots: female long-pedicelled and axillary. *Perianth* segments 4-5, ovate, imbricate, with woolly margins. *Stamens* 4-5, short. *Ovary* sessile, glabrous, except in the upper portion where it is narrowed into a short hairy style. *Fruit* an ellipsoid drupe, about .4 in. long, purplish-black, more or less reticulately rugose; *peduncle* .75-1.3 in. long.

Fairly common between 4,000 and 8,500 ft. in Jaunsar and Tehri-Garhwal, especially about villages where it is planted for shade and fodder; very numerous at Bámsu and Kúlni.

Wood yellowish-grey with irregular streaks of darker colour; annual rings distinct; weight 47 lbs. per c. ft. It is tough and strong, and is used for oars, whip-handles, churn-sticks and other purposes. The leaves are lopped for fodder.

New leaves and fl. Mar.-May. Fr. June-Sept.

4. **Trema**, Lour.

Shrubs or trees. *Leaves* alternate, generally 3-nerved; stipules caducous. *Flowers* very small, monœcious, in axillary cymes. *Sepals* 4-5, induplicate valvate in the male fls., subimbricate in the female. *Stamens* 5, erect in bud, longer than the sepals. *Ovary* sessile; style 2-fid. arms linear. *Fruit* a small drupe, supported by the persistent perianth and crowned by the arms of the style.

Analysis of the Species.

Leaves broad, soft, tomentose beneath 1. *T. orientalis*.

Leaves narrow, hard, rough on both surfaces 2. *T. politoria*.

1. **T. orientalis**, Bl. ; Fl. Br. Ind. v. 484 ; Brandis Ind. Trees 597 ; Gamble Man. Ind. Timb. 630. Syn.—*Sponia orientalis*, Planch. ; Brandis For. Flora 430. The Charcoal Tree. Vern. *Jiban*, Bengal.

A small rapidly-growing and short-lived tree; bark thin, greyish or bluish-green, smooth, but with numerous lenticels. *Leaves* 3-6 by 2-3·5 in. ovate or ovate-oblong, acuminate, crenate, serrulate, membranous, scabrid above, soft-tomentose beneath; base 3-7-nerved, cordate, lateral nerves 3-4 pairs above the basal, petiole 3-4 in. *Cymes* lax, spreading. *Drupe* 15 in. long, ovoid, black when ripe.

Gularghāti, Nakraunda and other swampy places in the Dûn; fairly common, but is apt to be mistaken for *Grewia lævigata*.

Wood light-reddish-grey, light and soft; weight 28 lbs. per c. ft. The bark gives a strong fibre, and the leaves are lopped for fodder.

Fl. Feb.-Apr. Fr. June-Aug.

2. **T. politoria**, Planch. ; Fl. Br. Ind. v. 484 ; Brandis Ind. Trees 597 ; Gamble Man. Ind. Timb. 631. Syn.—*Sponia politoria* Planch. ; Brandis For. Flora 430. Vern. *Khágshí*, *Khákshí*, *Kúri Dún* ; *Khardál*, Saháranpur.

A shrub or small tree with smooth bark and scabrid branches. *Leaves* 2-5 by 3-2 in., oblong or ovate lanceolate, acuminate, serrulate, subcoriaceous, very hard and scabrid on both surfaces, dark-green and shining above, paler beneath trinerved at the base, lateral

nerves 6-8 pairs, arcuate, depressed above ; base nearly equal, rounded or cordate ; petiole .2-4 in. *Cymes* compact, generally not exceeding the petiole. *Drupe* .1-15 in. diam., globose.

Common in the DEHRA and SAHARANPUR DIVISIONS, along ráu and river banks and in abandoned fields. Comes up freely on landslips as in the SAHARANPUR SIWALIKS, where it is very valuable for binding the soil.

Wood white, moderately hard. Growth very fast, only 2 rings per inch of radius. Weight 36 lbs. per c. ft. The bark gives a strong fibre used for making ropes. The leaves are lopped for fodder and are used like sandpaper to polish wood and horn.

New leaves Mar., Apr. Fl. Apr.-June. Fr. Oct., Nov.

III. MOREÆ.

5. *Streblus*, Lour.

1. *S. asper*, Lour. : Fl. Br. Ind. v. 489 ; Brandis For. Flora 410, Ind. Trees 615 ; Gamble Man. Ind. Timb. 632. Vern. *Dahia Kurcha*, Saháranpur.

A small evergreen tree with milky juice ; bark light-grey, irregularly ribbed. *Leaves* alternate, 2-4 in. long, elliptic rhomboid or obovate, irregularly toothed, acute, or obtuse, coriaceous, scabrid with minute raised dots ; base cuneate ; petiole .08-1 long, pubescent ; stipules lanceolate. *Flowers* generally dioecious. MALE FLS. in short-peduncled heads or spikes ; *sepals* 4, imbricate ; *stamens* 4, inflexed in bud ; *heads* sometimes androgynous. FEMALE FLS. pedunculate, solitary or a few together in the axils of leaves ; peduncle slender .6-8 in. long ; *sepals* 4, concave, embracing the ovary, enlarged in fruit ; *style* central, bifid, with long spreading arms. *Fruit* a 1-seeded globose berry, .2 in. long, yellow when ripe.

Common in the SAHARANPUR DISTRICT, especially towards the Jumná ; often planted in hedgerows ; Roshanpur, Shúfipur, Kásimpur, Ránipur, etc.

Wood white, moderately hard, tough and elastic ; weight 40 lbs. per c. ft. ; no heartwood. It is much sought after in Bengal for making yokes. The twigs are used as tooth brushes, and the rough leaves to polish wood and ivory. The milky juice is medicinal. The fruit is eaten when ripe.

New leaves Mar. Fl. Jan.-Mar. Fr. May-July.

6. **Broussonetia**, Vent.

B. papyrifera, Vent; Fl. Br. Ind. v. 490; Brandis Ind. Trees 613, For. Flora 410; Gamble Man. Ind. Timb. 633. The Paper mulberry.

A medium-sized deciduous tree with smooth grey bark, branchlets tomentose. *Leaves* alternate and opposite, 5-9 in. long by 2-6 in. broad, very variable, obliquely-ovate, acuminate, membranous, often lobed, dentate, scabrous above softly tomentose beneath, basal nerves 3; *petiole* 2-4 in. long; *stipules* 6-8 in. long, ovate, acuminate, deciduous. *Flowers* dioecious. *Male flowers* yellowish, in cylindrical catkins 2-5 in. long; *perianth* 4-fid, hairy; segments valvate; *stamens* 4, inflexed in bud. *Female flowers* reddish, in globose, pedunculate heads about 1.5 in. diameter, mixed with persistent hairy bracts; *perianth* 2-4-toothed, persistent; *ovary* superior, stipitate, 1-celled, included; *ovule* 1 pendulous; *style* filiform, pink. *Fruit* fleshy, red, shining; individual achenes on long fleshy stalks.

Indigenous to Upper Burma and Malaya. It was first introduced in the Kaunli garden at Dehra Dun whence it has spread and is now naturalised in many places. Wood very soft and light. The bark gives a fine fibre which is made into paper in Japan and into a cloth known as *tapa* in the South sea Islands. It grows very quickly and can be grown in a variety of climates. It coppices well.

Fl. March.

7. **Morus**, Linn.*The Mulberries.*

Trees or shrubs. *Leaves* alternate, serrate; base 3-nerved; stipules small, caducous. *Flowers* unisexual, in spikes. **MALE FLS.**: *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud, opposite to and longer than the sepals. *Pistillode* small. **FEMALE FLS.**: *Sepals* 4, imbricate, accrescent and succulent in fruit. *Ovary* 1-celled, straight; style central, 2-fid. *Fruit* a compound berry, the perianths coalescing to form a gelatinous pericarp.

Analysis of the Species.

- Perianth of female flowers of 4 sepals, the
 2 outer keeled 1. *M. alba*.
 Perianth of female flowers of 3 or 4 sepals,
 all similar 2. *M. serrata*.

1. ***M. alba***, Linn. : Fl. Br. Ind. v. 492 ; Brandis For. Flora 407, Ind. Trees 612 ; Gamble Man. Ind. Timb. 634. Vern. *Tútri*, *Tútri*, Dún ; *Tút*, Hind.

A middle-sized deciduous tree with pubescent shoots. *Leaves* 2-3 in. long, ovate to lanceolate, acute or acuminate, dentate or serrate, sometimes lobed, membranous, glabrous above, slightly pubescent along the midrib and nerves beneath ; base 3-nerved, rounded or truncate, sometimes cordate ; petiole .5-1.3 in. long, slender. *Flowers* monœcious. *Male spikes* .5-1.5 in. long, puberulous ; *sepals* 4, the 2 outer keeled. *Female spikes* short, ovoid, pedunculate ; styles short, free. *Fruit* .3-5 in. long, white or dark purple ; peduncle .5-.7 in. long, slender.

Cultivated or run wild in the Dún. Planted in avenues along the Dehra—Rámpur-Mandi Road.

The wood is fine and close-grained, and is used for building boats, furniture and agricultural implements ; weight 36-56 lbs. per c. ft. Silk-worms are fed on its leaves, and the fruit is eaten, that of some varieties being excellent.

New leaves and fl. Mar., Apr. Fr. May, June, or later.

M. indica, Linn. ; Fl. Br. Ind. v. 492 ; Brandis For. Flora 403, Ind. Trees 612 Vern. *Sia Tút*.—A moderate-sized tree with fruit black when ripe. It is considered by some botanists to be a form of *M. alba*, from which it differs in the leaves being caudate-acuminate and the styles being long, hairy, and connate to one-fourth of their length. I have seen no authentic specimens from the area of this flora.

2. ***M. serrata***, Roxb. ; Fl. Br. Ind. v. 492 ; Brandis For. Flora 409, Ind. Trees 612 ; Gamble Man. Ind. Timb. 635. Vern. *Kimú*, Jaunsar ; *Himú*, also *Tút* or *Tút*, Dún.

A large deciduous tree with scaly buds ; bark reddish or greyish-brown, generally smooth and lenticellate on branches, exfoliating on old stems ; young shoots pubescent. *Leaves* 2-8 by 1.5-6 in., broad-ovate, generally cordate, toothed or serrate (sometimes doubly), often 3-lobed, shortly caudate-acuminate, membranous, slightly pubescent or glabrous above, thickly grey-tomentose beneath, 3-nerved at the base ; petiole 1-1.7 in., tomentose

tose. *Flowers* dioecious. *Male spikes* 1-2·5 in. long, villous; sepals 3 or 4, all similar. *Female spikes* ·5-·7 in. long; styles connate high up, very hairy. *Fruit* ·7-1 in. long, mucilaginous, purple; peduncle ·1-·2 in. long, stout, hairy.

Cultivated and wild in JAUNSAAR and TEHRI-GARHWAL, 4-9,000 ft.; also in the DŪN, e.g., at Kālūwāla. Common at Mussoorie.

Sapwood small, white; heartwood yellow or brown, moderately hard, fine-grained; weight about 35 lbs. per c. ft. It works and seasons well and takes a fine polish. It is used for cabinet-work and agricultural implements. The leaves are used as cattle-fodder. The fruit is sweet, and is eaten.

New leaves and fl. in Apr., May. Fr. June-Aug.

M. lævigata, Wall.; Brandis Ind. Trees 613. Vern. *Shahtut*.—Occasionally cultivated in gardens. It is a large deciduous tree, indigenous to the Outer Himalaya from Kumaon eastwards, Khasi Hills and Burma. Fruit 2-3·5 in. long, cylindric, white, or purple, sweet when quite ripe.

IV. ARTOCARPEÆ.

8. *Ficus*, Linn.

The Figs.

Trees or shrubs with milky sap. *Leaves* alternate (opposite in *F. hispida* and *samocarpa*), entire toothed or lobed; stipules deciduous. *Flowers* minute, unisexual, on the inner surface of a fleshy hollow receptacle which has an aperture at the apex partly closed by imbricate bracts, often mixed with bracteoles. **MALE FLS.:** *Perianth* thin, 2-6-partite, imbricate. *Stamens* 1-2; anthers of 2 distinct cells. **FEMALE FLS.:** *Perianth* as in the male, or none. *Style* eccentric; ovule pendulous. *Achenes* crustaceous or fleshy. *Receptacles* bracteate, 1-sexual or androgynous, with the male flowers near the mouth.

NOTE.—Besides the male and female, two other kinds,—gall and neuter flowers,—are sometimes found in the receptacles. The gall flowers are females with shorter styles and with the ovary occupied by the pupa of a Hymenopterous insect (Gall-insect). The neuter flowers, which only occur in one or two species not found in

India proper, have the perianth of the males, but no stamens. In the same receptacle there may be males and females, or males, females and galls, or males and galls, or females and neuters, or only females.

Analysis of the Species.

A. Epiphytic in early life. Receptacles axillary, in pairs, sessile except in 1 and 3.

Petiole not jointed to the blade, and less than $\frac{1}{4}$ its length.

Leaves thinly coriaceous, often up to three times as long as broad.

Leaves and branchlets scaberrulous ; stipules as long as the petiole . . . 1. *F. gibbosa*.

Leaves and branchlets smooth ; stipules scarcely $\frac{1}{2}$ the length of the petiole 3. *F. glaberrima*.

Leaves thickly coriaceous, scarcely twice as long as broad.

Leaves large ; nerves distinct, reticulate 2. *F. bengalensis*.

Leaves small ; nerves faint, parallel 4. *F. rectus*.

Petiole jointed to the blade, and usually equal to at least half its length.

Leaves broad, caudate acuminate ; ripe fruit black.

Leaves caudate at the apex, acuminate about half the length of blade ; stipules minute . . . 7. *F. religiosa*.

Leaves acuminate at the apex, acuminate about one-fifth the length of blade ; stipules .5-1.5 in. long.

Base of leaf truncate or slightly narrowed into the petiole ; a medium-sized tree . . . 5. *F. Rumphii*.

Base of leaf usually cordate, never narrowed into the petiole ; a small tree or shrub, often epiphytic . . . 6. *F. Arnottiana*.

Leaves narrow, abruptly acuminate ; ripe fruit white . . . 8. *F. infectoria*.

B. Not epiphytic in early life. Receptacles axillary, solitary except in 17, peduncled.

Erect shrubs or small trees.

Leaves narrow abruptly long-acuminate, hard, distantly toothed . . . 10. *F. clavata*.

Leaves narrow, gradually acuminate, soft, quite entire . . . 17. *F. nemoralis*.

Leaves broad, acute, closely dentate or crenate . . . 16. *F. palmata*.

Scandent or prostrate shrubs.

Leaves and fruit very rough . . . 9. *F. heterophylla*.

Leaves and fruit more or less smooth.

Leaves subacute, coriaceous lat. nerves 3-6 pairs; receptacles small . . . 14. *F. scandens*.

Leaves long-acuminate, membranous lat. nerves 5-10 pairs; receptacles large . . . 15. *F. foveolata*.

C. Never epiphytic; receptacles generally on leafless racemose branches (axillary on young plants of 11 and 12).

Leaves opposite.

A small tree; leaves broad . . . 11. *F. hispida*.

A small prostrate shrub; leaves narrow . . . 12. *F. sœmocarpa*.

Leaves alternate.

Leaves unequal-sided; petiole very short . . . 13. *F. Cunia*.

Leaves symmetrical; petiole usually long.

Basal nerves 5-7; leaves large, subcoriaceous, cordate . . . 18. *F. Roxburghii*.

Basal nerves 3.

Leaves 4-7 in. long, entire; a large tree . . . 19. *F. glomerata*.

Leaves 5-14 in. long, toothed; a small tree . . . 20. *F. pomifera*.

1. ***F. gibbosa***, Bl.; Fl. Br. Ind. v. 496; King Fic. 4, t. 2; Brandis Ind. Trees 599; Gamble Man. Ind. Timb. 637. Syn.—*F. parasitica*, Kœnig; Brandis For. Flora 420. Vern. *Chhānchri*, Dún and Garhwal; *Dádu Bándaí*, Dún.

A much-branched small evergreen tree, epiphytic in early life; bark thin, brownish-grey. *Leaves* alternate, 2.5-4.5 by 1.2 in., elliptic-oblong, acute at both ends, entire subcoriaceous, generally smooth above, always more or less scaberulous beneath, somewhat oblique and 3-nerved at the base; lateral nerves 4-6 pairs, prominent beneath, arcuate, joining within the margins; petiole .2-.4 in. long; stipules ovate-lanceolate, convolute, generally as long as the petiole. **MALE FLS.**; *sepals* 4-6, linear, fleshy, hairy; *stamen* 1; *pistil* abortive. **GALL FLS.**; *sepals* of the male; *style* short. **FEM. FLS.** in separate receptacles; *sepals* 4, hyaline; *style* elongate. *Receptacles* .2-.3 in. across, solitary or in pairs, pyriform-globose, scabrid and mammillate, yellow when ripe; basal bracts 0; peduncle .2-.3 in. long, bracteate at the base.

Very common in the DŪN as an epiphyte generally on large old trees, notably Pipal and Haldū; Kāluwāla, Lachiwāla, Dūdhli, Phāndowāla, etc. Occasionally in the SAHĀRANPUR DISTRICT.

The leaves are very good for cattle-fodder, and are said to increase the flow of milk in milch cows.

Fr. ripens Jan.-Mar.

Two varieties of this species occur in the area.

1. Var. *parasitica*, sp. Kœnig. *Leaves* broad, nearly rhomboid, more or less scabrid on both surfaces, nerves opaque.

2. Var. *cuspidifera*, sp. Miq. *Leaves* elongate, acute or acuminate generally smooth above, nerves pellucid.

2. **F. bengalensis**, Linn.; Fl. Br. Ind. v. 499; King Fic. 18, t. 13; Brandis For. Flora 412, Ind. Trees 600; Gamble Man. Ind. Timb. 638. The Banyan tree. Vern. *Bar, Bargat*, Hind.

A large evergreen tree throwing down numerous aërial roots from the branches which are mostly horizontal; bark greyish-white, smooth, exfoliating in irregular flakes; young parts softly pubescent. *Leaves* alternate, 4-8 by 2.5 in., ovate or elliptic, entire, obtuse, subcordate or rounded at the base, thickly coriaceous, glabrescent above, with 3-7 basal nerves and 4-6 pairs of main lateral nerves; petiole 1.2 in. long, stout; stipules .7-1 in. long, coriaceous, sheathing. **MALE FLS.** crowded near the mouth of the receptacle; *sepals* 4; *stamen* 1. **FEMALE FLS.** with a shorter *perianth*; *style* long; male and female in the same receptacle. *Receptacles* .5 in. diam., in axillary pairs, sessile, globose, puberulous, red when ripe, supported on 3 broad coriaceous basal bracts.

Fairly common in the Sāl forests of the DŪN and along the foot of the SĪWĀLIKs in the SAHĀRANPUR DISTRICT. Much planted in villages and in avenues throughout India. Assisted by the aëri-ol

roots which serve as supports for the branches and also as feeders the crown spreads enormously when the tree grows out in the open. Trees with crowns 200 to 300 ft. in diam. are not uncommon, while the girth often attains 25 to 30 ft., and the height 80 to 90 ft.

Wood grey, moderately hard, appearing as composed of thin plates on a cross section; no heartwood; weight about 40 lbs. per c. ft. It is durable under water, and is therefore used for well-curbs. The wood of the drops is tough and elastic, and is used for tent-poles, cart-yokes and carrying-poles. The milky juice is made into bird-line. The leaves and twigs are a favourite fodder for cattle and elephants; the former are also used as plates. Lac is sometimes collected on the tree. The fruit is eaten in times of scarcity and is greedily devoured by birds and monkeys. The tree is easily propagated by cuttings. It is, however, a nuisance in forests where it takes too much space, and its dense shade makes it impossible for any other trees to grow under it. In the DŪN Forests the Haldū seems to be the most favourite host for the epiphytic Banyan.

New leaves Mar., Apr. Fr. ripens Apr., May.

3. **F. glaberrima**, Bl.: Fl. Br. Ind. v. 506; King Fic. 37, t. 43; Brandis Ind. Trees 600; Gamble Man. Ind. Timb. 640. Vern. *Kákhri*, *Kháukri*, *Durlá*, Hind.

A tall tree, epiphytic in early life; bark thin, dark-grey, smooth. *Leaves* alternate, 4-6 by 1.5-2 in. oblong ovate-lanceolate or elliptic, shortly blunt-acuminate, entire, sub-coriaceous, glabrous and shining above, minutely pubescent or glabrescent beneath; main lateral nerves 8-10 pairs, rather horizontal, arcuate, joining within the margins; base subacute or slightly rounded, 3-nerved; petiole .5-1.2 in. long; stipules linear-lanceolate, .4-.75 in. long, glabrous. *MALE FLS.* few, near the mouth of the receptacle; *sepals* 4, lanceolate; *stamen* 1, filament short. *GALL FLS.*; *perianth* 4-cleft. *FEM FLS.*; *perianth* 0. *Receptacles* .2-.3 in. across, in axillary pairs, globose, slightly verrucose when young, smooth and orange-coloured when ripe; peduncle about half the length of the subtending petiole; basal bracts 3, broad, minute, deciduous.

Swampy localities in the DŪN, e.g., Nakraunda and Mothron-wála, and along streams in shady ravines at low elevations in the HILLS, e.g., Tons bank near Kálsi. Also in the Sansárú Khálá MÁLEŌT.

The leaves and tender young shoots are lopped for fodder. Fr. ripens Feb., Mar.

4. **F. retusa**, Linn. var. *nitida*, Thunb.; Fl. Br. Ind. v. 511. King Fic. 50, t. 62; Brandis For. Flora 417, Ind. Trees 603; Gamble

Man. Ind. Timb. 643. Of all the Figs described in this book, it resembles *F. elastica* most closely, from which, however, it differs in having smaller leaves and subglobose receptacles. The flowers also are different.

A large evergreen tree; bark dark-grey, smooth, with transverse lines of lenticel bars. Leaves alternate, 2-4 by 1.3-2.5 in., ovate elliptic or rhomboid, acute or short-acuminate, entire, coriaceous glabrous and shining; lateral nerves numerous, slender; base 3-nerved, narrowed into the petiole which is .3-.5 in. long; stipules lanceolate, about .5 in. long; MALE FLS. numerous; *sepals* 3, oblanccolate; *stamen* 1. GALL FLS.; *sepals* 3, spatulate. FEM. FLS.; *perianth* very small; *ovary* smooth; *style* short. *Receptacles* about .2 in. diam., in axillary pairs, sessile, subglobose, yellowish when ripe; basal bracts broad-ovate, persistent.

Only a few indigenous-looking trees in the Buláwala Pass in the SIWALIKS behind the crest; elevation 3,000 ft. Cultivated at DEHRA DÚN and SAHÁRANPUR.

Wood light reddish-grey, moderately hard, very prettily mottled, but used chiefly for fuel; weight about 40 lbs. per c. ft. The leaves are used for elephant-fodder. Evergreen and umbrageous, it makes an excellent avenue tree.

Fr. Feb., Apr.

5. **F. Rumphii**, Bl. : Fl. Br. Ind. v. 512; King Fic. 54, t. 67B; Brandis Ind. Trees 601; Gamble Man. Ind. Timb. 644. Syn.—*F. cordifolia*, Roxb. : Brandis For. Flora 416, Vern. *Pilkhan*, *Khabar*, Hind.; *Pilthoi*, Jaunsar.

A large deciduous tree; bark yellowish-grey, smooth, on older stems exfoliating in hard scurfy scales. Leaves alternate, 4-6 in. long, broad-ovate or ovate-oblong, acuminate, quite glabrous, shining above; acumen never exceeding an inch, often quite short; margins entire, undulate; lateral nerves 3-6 pairs; base truncate, rounded or narrowed towards the petiole, rarely subcordate, 3-5-nerved; petiole 2-3.5 in., channelled or flattened above, jointed to the blade. MALE FLS. few near the mouth of the receptacles; *sepals* 3; *stamen* 1. FEMALE and GALL FLS.; *sepals* 3, lanceolate; *ovary* ovoid, smooth; *style* elongate. *Achenes* mucilaginous. *Receptacles* .5 in. across, globose, sessile, in axillary pairs, black when ripe; basal bracts 3, orbicular.

Common in the DÚN and SAHÁRANPUR FORESTS, and also in the Tons and Jumná Valleys in JAUNSAIR and TEHRI-GARHWAL.

Wood very soft, spongy, pinkish-white, mottled on a radial section; weight 27 lbs. per c. ft. Lac insects are reared on it in ASSAM. The leaves and branches are lopped for cattle-and

elephant-fodder, and the fruit is eaten. Often planted in avenues, but is a destructive epiphyte in forests.

New leaves in Mar. Fr. ripens May, June.

6. **F. Arnottiana**, Miq. ; Fl. Br. Ind. v. 513 : King. Fic. 56, t. 68 ; Brandis Ind. Trees 602 ; Gamble Man. Ind. Timb. 638. Vern. *Paras Pipal*.

A small glabrous tree or shrub often epiphytic, also on rocks ; bark pale pinkish or yellowish brown. *Leaves* alternate, 3-7 in. long by 2-5 in. broad, broadly ovate, entire, subcoriaceous, acuminate at the apex, base usually more or less deeply cordate, never narrowed to the petiole, 5-7 nerved ; lateral nerves 5-8 pairs, reticulations fine, lucid ; *petiole* 1-5-5 in. long ; *stipules* ovate-lanceolate, .5-1-5 in. long, caducous. *Receptacles* sessile or shortly peduncled ; in pairs or clusters, mostly from the axils of fallen leaves, .25-.35 in. diam., depressed globose, purple with greenish dots when ripe ; *basal bracts* 3, brown, membranous. *Male-flowers* few, near the mouth of the receptacles ; *sepals* 3, inflated, broadly acuminate ; *stamen* 1, *anther* subsessile. *Female and Gall flowers* : *perianth* gamophyllous, toothed at the apex, completely investing the ovary ; *style* elongate ; *stigma* flat.

Tehri-Garhwal ; Tons Valley ; Thadiar ; Chaukhamb ; etc. Fr. July.

The leaves resemble those of *F. Rumphii*, but the base is never narrowed to the petiole and the stipules are larger.

7. **F. religiosa**, Linn. ; Fl. Br. Ind. v. 513 ; King Fic. 55, t. 67A ; Brandis For. Flora 415, Ind. Trees 601 ; Gamble Man. Ind. Timb. 644. Vern. *Pipal*, *pipli*, Hind.

A large deciduous tree ; bark grey, with brownish specks, smooth, exfoliating in irregular flakes ; trunk irregularly shaped. *Leaves* alternate, 4-5-7 by 3-5 in., orbicular-ovate, thinly coriaceous but tough, shining above, reddish when young, white-tubercled when mature ; acumen about half the length of the blade ; margins entire, undulate ; main lateral nerves 6-8 pairs, joined by prominent closely-reticulate veins ; base shallow-cordate rounded or truncate, sometimes abruptly narrowed into the petiole, 5-7-nerved ; petiole 3-4 in. long, terete, slender, nodding, jointed to the blade ; stipules minute. MALE FLS. very few, often absent, sessile ; *sepals* 3 ; *stamen* 1, filament short. GALL and FEMALE FLS. ; *sepals* 5 ; *style* short, lateral. *Receptacles* .5 in. across, sessile, in axillary pairs, sub-globose or somewhat depressed, dark-purple, when ripe ; basal bracts 3, rounded, coriaceous, pubescent.

A well known and common tree throughout India, both in forests and about habitations, much planted by Hindus, especially

near temples and wells, often up to as high as 5,000 ft. in the OUTER HIMALAYA. It is held in so much veneration by the Hindus that killing a Pipal tree is looked upon as a great sin, second only to that of killing a Bráhmaṇ.

Wood greyish-white, moderately hard, not so mottled as of the preceding species; weight 30-40 lbs. per c. ft. It is made into charcoal and used for packing cases. The leaves and branches are good for elephant-fodder. The milky juice hardens into a substance resembling guttapercha. It is a fast-growing tree and very suitable for avenues, for which purpose it can be propagated by cuttings. It is, however, an epiphyte destructive to forest trees, and often does great damage to buildings and walls on which it grows by sending down roots through their crevices.

New leaves Feb.-Apr. Fr. ripens Apr., May.

8. *F. infectoria*, Roxb.; Fl. Br. Ind. v. 515; King Fic. 60, t. 75-79; Brandis For. Flora 414, Ind. Trees 602; Gamble Man. Ind. Timb. 645. Vern. *Khabar*, Hind.; *Dúthli*, *Pilkhói*, Jaunsar; *Pákhár*, Dún; *Kobrá*, *Pilkháru*, Garhwal. This tree is often mistaken for *F. Rumphii* and for *F. glaberrima*; consequently the same vernacular names are usually applied to all three of them indiscriminately.

A large tree with greenish-grey smooth bark, sometimes sending down a few aerial roots. *Leaves* alternate, 3-6 in. long, oblong-ovate or ovate, abruptly acuminate, glabrous and shining, rather membranous; margins entire, undulate; lateral nerves 6-8 pairs; base acute, rounded or cordate, 3-nerved; petiole 1.5-2 in. long, channelled. MALE FLS. few, sessile; *sepals* 4; *stamen* 1, anther broad-ovate. FEMALE and GALL FLS.; *sepals* 3 or 4; *stigma* elongate. *Receptacles* .25 in. diam., sessile, globose, in axillary pairs, tubercled, white when ripe; basal bracts 3, ovate, minute.

Not uncommon in the DÚN, but abundant in the Pathri Forest and elsewhere in the SAHÁRANPUR DISTRICT, often as an epiphyte on other trees in early life; also found in the TONS VALLEY near Thadiár.

Wood grey, moderately hard, but not durable; weight 35 lbs. per c. ft. Medullary rays prominent on a radial section. The young shoots are eaten in curries; the leaves are a good elephant-fodder. The bark gives a fibre which can be used for rope.

Two varieties of this species occur in our area:—

1. The type; *leaves* rather narrow; petiole hardly exceeding 1.5 in.; *receptacles* sessile:—more common in the HILLS.

2. Var. *Lambertiana*, sp. Miq. *Leaves* broader, generally cordate or rounded at the base; petiole up to and even exceeding

2 in.; *receptacles* shortly peduncled, somewhat larger, sometimes whitefelted:—found along the foot of the SIWALIKS, and also in the plains beyond.

New leaves Feb.-Apr. Fr. ripens May, June, but remains long on the tree.

9. **F. heterophylla**. Linn.; Fl. Br. Ind. v. 518; King Fic. 75, t. 94; Brandis For. Flora 424, Ind. Trees 606; Gamble Man. Ind. Timb. 646.

A straggling or creeping shrub. *Leaves* alternate, 2-6 in. long, very variable, from narrow-lanceolate to broad-ovate, entire or lobed, toothed or repand, scabrid, acuminate; petiole .5-2 in. long; stipules .5 in. long, ovate. *Receptacles* .5-1 in. long, globose or pyriform, solitary, yellow and smooth when ripe, scabrid when young, mouth partially open; peduncle .5-1 in. long; basal bracts minute.

Generally on banks of rivers and moist localities; e.g., Robbers' Cave, Tapkeswar and such other places in the DÚN; rather rare.

10. **F. clavata**, Wall.; Fl. Br. Ind. v. 520; King Fic. 87, t. 111; Brandis Ind. Trees 604; Gamble Man. Ind. Timb. 646. Syn.—*F. trachycarpa*, Miq.; Brandis For. Flora 421. Vern. *Khánoi*, Jaunsar; *Sánsai*, Kálsi.

A shrub or small tree with rough branchlets. *Leaves* alternate, 4-8 in. long, oblong-lanceolate, long-acuminate, distantly toothed, hard and rough; main lateral nerves 6-8 pairs, arcuate; petiole .1-2 in. *Receptacles* axillary, solitary, globose, ellipsoid or obovoid, .5-8 in. long, with a rough uneven surface, yellow when ripe; peduncle .1-2 in. long; basal bracts minute.

Shady valleys in the OUTER HIMALAYA and also in JAUNSAAR and TEHRI-GARHWAL; Laduaköt, Kálsi, Thadiár, etc. Often cultivated round villages for fodder.

Fr. ripens in May and June.

11. **F. hispida**, Linn.; Fl. Br. Ind. v. 522; King Fic. 116, t. 154; Brandis For. Flora 423, Ind. Trees 606; Gamble Man. Ind. Timb. 647. Vern. *Káksá*, *Ghogshá*, *Gobhá*, Dún; *Goblá*, Hind.

A moderate-sized tree with hollow branches; bark thin, grey or greenish, warty on old stems, otherwise smooth, often with transverse wrinkles. *Leaves* opposite, 4-12 in. long, ovate or obovate-oblong, acute or shortly acuminate, serrate or dentate, rarely entire, coriaceous, scabrid above, tomentose beneath; lateral nerves 4-6 pairs, the lowest pair from the base; base rounded or subcordate,

rarely cuneate; petiole .5-4 in. long, hispid; stipules .5 in. long, pubescent. MALE FLS.; *sepals* 3, broad. GALL and FEMALE FLS.; *perianth* tubular and short or none; *style* short, lateral. *Achene* rhomboid. *Receptacles* obovate, 1 in. long, pale-green and faintly ribbed when ripe, hispid, usually clustered on leafless, often drooping, branchlets from the trunk or old wood, less frequently (generally on very young plants and shoots) in axillary pairs; peduncle .2-5 in. long; basal bracts 3, small, persistent.

Fairly common in the DÚN and SABARANPUR DIVISIONS, generally in shady places.

Wood dirty-grey, coarse-grained, soft, no heartwood, no annual rings; weight about 30 lbs. per c. ft. The leaves are lopped for cattle-fodder. The young fruit is made into curries. The bark of young shoots gives a strong fibre which is good for rope.

New leaves Feb., Mar. Fr. generally throughout the year.

12. **F. *sæmocarpa***, Miq.; Fl. Br. Ind. v. 523; King Fic. 115, t. 152; Brandis Ind. Trees 606; Gamble Man. Ind. Timb. 647. Syn.—*F. tuberculata*, Wall.; Brandis For. Flora 424.

A low spreading shrub; young shoots, petioles and nerves rusty hirsute. *Leaves* opposite, crowded at the ends of the branches, 3-9 by .7-1.5 in., narrowly oblanceolate, less frequently lanceolate, acuminate, generally entire, often more or less scabrid; main lateral nerves 6-8 pairs, very arcuate; base 3-nerved, gradually narrowed to the petiole; petiole .3-9 in. long; stipules persistent, scarious, about as long as the petiole. MALE FLS. with 3-4 *sepals* and 1 *stamen*. GALL and FEM. FLS. without any *perianth*. *Receptacles* .5-1 in. across, axillary and solitary on young plants, in short axillary panicles on old stems, pyriform-globose, verrucose, longitudinally 8-10-ribbed; peduncle .3-6 in. long, pubescent; basal bracts 3, triangular, deciduous.

Robbers' Cave in the DÚN; trailing on rocks near streams. Somewhat rare.

Fr. ripens Dec.-Feb.

13. **F. *Cunia***, Ham.; Fl. Br. Ind. v. 523; King Fic. 101, t. 126; Brandis For. Flora 421, Ind. Trees 606; Gamble Man. Ind. Timb. 648. Vern. *Khain*, *Kheiná*, Dún; *Jarkphali*, Hind.

A moderate-sized tree with dark-grey bark. *Leaves* alternate, 6-10 in. long, oblong-lanceolate, very unequal-sided, acuminate, serrate, rarely entire, scabrid on both surfaces or glabrate above and pubescent beneath, coriaceous; lateral nerves 8-12 pairs; base semi-cordate or semisagittate with a large round 3-nerved lobe on one side; petiole .2-6 in. long, scabrid; stipules .7-1 in. long, linear-

lanceolate. *Male sepals* 3. *Female* and *gall sepals* 4, united below; *style* lateral. *Achene* ovoid, mucilaginous. *Receptacles* globose or pyriform, .5-.7 in. diam., hispid, reddish-brown and ribbed when ripe, on leafless panicked racemes which issue in great numbers from the trunk and the larger branches, and are often several feet long.

Along ravines and watercourses in the DUN and SAHARANPUR DIVISIONS, and also up to 4,000 feet in JAUNSAAR and TEHRI-GARHWAL; fairly common.

Wood greyish-brown, rough, moderately hard; weight about 35 lbs. per c. ft. The fibres of the bark are made into coarse ropes. The fruit is eaten, though somewhat insipid. The leaves are good for fodder, and can be used for polishing wood.

Fr. ripens in Aug., Sept. or throughout the year.

14. **F. scandens**, Roxb.; Fl. Br. Ind. v. 526; King Fic. 129, t. 162; Brandis For. Flora 421, Ind. Trees 609; Gamble Man. Ind. Timb. 648. Vern. *Makhotā*, Jaunsar; *Chhūnchri*, Dūn and Garhwal.

A scandent shrub rooting at the nodes, trailing on rocks and ascending tall trees; bark rather thick, horizontally wrinkled, tougher when dry than the porous wood inside. *Leaves* alternate, 2-4 in. long, ovate or elliptic, acute, entire, chartaceous, glabrous and smooth above, roughish beneath from the prominent veins; lateral nerves 3-6 pairs above the basal pair; base rounded or very slightly narrowed; petiole .3-.7 in., hairy; stipules .2 in., acute. *Receptacles* solitary or in pairs, globose, .3 in. diam., rough, often hairy outside, greenish-yellow when ripe; peduncle .3-.6 in. long; basal bracts 3-4, ovate, persistent.

Common in the DUN and JAUNSAAR DIVISIONS, up to 5,000 ft., generally in damp places or not far from watercourses.

Fr. ripens rainy season.

15. **F. foveolata**, Wall.; Fl. Br. Ind. v. 528; King Fic. 133, t. 166-168; Brandis For. Flora 423, Ind. Trees 608; Gamble Man. Ind. Tind. 648.

An evergreen scandent shrub with pubescent shoots and rooting branches. *Leaves* alternate, 2-4 in. long, ovate elliptic oblong or lanceolate, usually acuminate (acumen .5-.7 in. long), entire, membranous or thinly coriaceous, glabrous above, pubescent or glabrescent beneath; lateral nerves 5-10 pairs; base rounded subcordate or slightly cuneate, 3-nerved; petiole .3-.8 in., hairy. *Receptacles* .3-.5 in. diam. if globose, twice as long if ovoid, hairy; peduncle .1-.3 in. long; bracts 3, ovate, membranous, reflexed.

Generally in the same sort of localities as *F. heterophylla* up to 6,000 ft.; Robbers' Cave; Kalsi; Mussoorie, Thadiar, Bamsu, etc.

16. ***F. palmata***, Forsk.; Fl. Br. Ind. v. 530; King Fic. 146, t. 185; Brandis Ind. Trees 607; Gamble Man. Ind. Timb. 649. Syn.—*F. virgata*, Roxb.; Brandis For. Flora 419, Vern. *Pheru*, *Khemri*, Dún; *Anjiri*, U. P.; *Fagwára*, Punjab.

A bush or small tree with smooth grey bark. *Leaves* alternate, 3-5 in. long, orbicular-ovate, acute or apiculate, toothed or serrate, sometimes deeply palmately lobed with the lobes pinnatifid, scabrid above, tomentose beneath; lateral nerves 6-8 pairs, the lowest pair from the base; base truncate or abruptly narrowed to the petiole; petiole .5-1 in. long, pubescent; stipules ovate, acute. MALE FLS. on hairy pedicels. GALL FLS.; *style* lateral, very short; stigma dilated. FEMALE FLS.; *style* subterminal, long, stigma 2-fid. *Receptacles* .5-1 in. diam., usually solitary, subglobose or pyriform, generally pubescent, yellow when ripe; basal bracts 3, acute, deciduous; peduncle .5-7 in. long.

Common in JAUNSAK and TEHRI-GARHWAL, up to 5,000 ft., also along river banks a long way into the plains, no doubt from seeds deposited by flood-water, e.g., the banks of the Jumná, Sông and Súsá; Ambári, Kánsráu; Khárá, etc.

Wood white, close- and even-grained, moderately hard; weight about 40 lbs. per c. ft. The leaves are lopped for cattle-fodder and the fruit is eaten.

New leaves Mar., Apr. Fr. ripens June-Oct.

Closely allied to this species is the Fig-tree, *F. Carica*, Linn., Vern. *Anjir*, which is cultivated for its fruit in DEHRA and SAHÁRANPUR. Indigenous in Syria, Palestine and Southern Europe.

17. ***F. nemoralis***, Wall.; Fl. Br. Ind. v. 534; King Fic. 161, t. 206; Brandis For. Flora 424, Ind. Trees 608; Gamble Man. Ind. Timb. 649. Vern. *Dúdhla*, *Dúdhoi*, Jaunsar; *Parphútá*, *Dúdhla*, Garhwal. The type of this plant has not been found in the region of this Flora. The following description refers to var. *Fieldingii*, Miq.

A small handsome tree, not epiphytic; bark thin, greyish-brown, fairly smooth. *Leaves* alternate, 4-6 by 1-2 in., lanceolate or elliptic, sharply long-acuminate, quite entire, membranous, glabrous, main lateral nerves 8-12 pairs, rarely more, with regular reticulations between, which are very distinct and dark-coloured beneath, especially when young; base very acute, 3-nerved; petiole .7-1.3 in. long, slender; stipules .3-.5 in. long, convolute, glabrous.

MALE FLS. pedicelled, few in the fem. receptacles, numerous in gall receptacles; *sepals* (in all fls.) 3, lanceolate, fleshy; *stamens* 2-3. GALL FLS. many; *ovary* ovoid, crustaceous. FEM. FLS. few; *ovary* triangularly obovoid; *style* longer than in gall flowers. *Receptacles* 2-3 in. across, axillary, solitary or in pairs, subglobose, glabrous, reddish when ripe; peduncles as long as the receptacles; basal bracts 3, broad, united, persistent.

JAUN SAR and TEHRI-GARHWAL, 3-7,000 ft. Chakrata, Jádi Mautargádh, Mussoorie, etc.; often planted about villages.

The leaves are lopped for cattle-fodder, and the ripe fruit is eaten.

Fr. ripens Oct., Nov.

18. **F. Roxburghii**, Wall.; Fl. Br. Ind. v. 534; King Fic. 168, t. 211; Brandis For. Flora 422, Ind. Trees 609; Gamble Man. Ind. Timb. 649. Vern. *Timlá*, *Timal Tirmal*, Hind.; *Tirboi* Jaunsar.

A middle-sized tree with grey warty bark; young shoots hollow. *Leaves* alternate, 5-15 by 4-12 in., broad-ovate or rounded, acute or mucronate, entire or toothed, subcoriaceous, glabrous or glabrescent above, softly pubescent beneath; lateral nerves 3-6 pairs, joined by transverse veins; base generally deeply cordate, strongly 5-7-nerved; petiole 1-10 in.; stipules 5-1 in., ovate-lanceolate, pubescent. MALE FLS.: *sepals* large, imbricate; *stamens* 2-3. GALL FLS.: *perianth* 2-3-lobed; *style* short, subterminal. FEMALE FLS.: *perianth* of gall fl.; *style* long, lateral. *Receptacles* turbinate, depressed, largest 2 in. long and 3 in. broad, tubercled, longitudinally ribbed, purple-orange when ripe, in clusters of 6 to 20 on short thick leafless branchlets from the trunk; peduncle 7-15 in. long, pubescent; basal bracts 3, triangular. *Achene* viscid.

SIWALIK and OUTER HIMALAYA; also JAUN SAR and TEHRI-GARHWAL, ascending to 5,000 ft. Very common near Asárori in the Dún and in the Mautargádh in TEHRI-GARHWAL. Often cultivated for its fruit.

Wood reddish-grey, moderately hard; medullary rays prominent on a radial section; weight 34 lbs. per c. ft. The fruit is eaten. The leaves make a good fodder for cattle and elephants, and are also used for plates.

Fr. ripens Apr.-June.

19. **F. glomerata**, Roxb.; Fl. Br. Ind. v. 535; King Fic. 173, t. 218; Brandis For. Flora 422, Ind. Trees 609; Gamble Man. Ind. Timb. 650. Vern. *Gúlar*, Hind.

A middle-sized or large tree; bark smooth, reddish-brown. *Leaves* alternate, 4-7 in. long, ovate- or obovate-oblong or oblong-lanceolate, subacute, entire, membranous, glabrous above when full-grown, generally somewhat pubescent beneath; main lateral nerves 3-7 pairs; base obtuse, rarely acute, 3-nerved; petiole 1-2 in., stipules .5-1 in., ovate-lanceolate. *Male sepals* inflated. *Gall* and *female perianths* toothed. *Receptacles* subglobose, 1-1.5 in. diam., downy, red or orange when ripe, in short thick paniculate clusters on the trunk and larger branches, rarely axillary; peduncle .3-1 in. long; basal bracts 3, triangular-ovate, small.

Abundant throughout the DEIRA and SAHARANPUR DIVISIONS, especially in ravines, river banks and marshy places. Not uncommon in the Tons Valley, JAUNSAR.

Wood grey, soft, mottled on a radial section; weight 25-36 lbs. per c. ft. It is used for making toys and effigies in Bengal, and is said to be durable in water. It is one of the few woods prescribed in Hindu scriptures for sacrificial fires. Bird-lime is made of the milky juice which is also good for gum-boils. The fruit is **caten** raw or cooked. The leaves are used for cattle and elephant fodder. Several parts of the tree are used in Hindu medicine.

New leaves Jan.-Apr. Fr. ripens Apr.-July.

20. **F. pomifera**, Wall.; Fl. Br. Ind. 535; King, Fic. 171, t. 215; Brandis Ind. Trees 609.

A small tree; bark smooth, brownish grey; branchlets hollow, pubescent when young. *Leaves* alternate, variable in size, 5-14 in. long by 2-6.5 in. broad, elliptic or elliptic-oblong remotely and irregularly toothed, shortly acuminate, rounded or very slightly acute at the base, lateral nerves 4-6 pairs, the lowest pair basal, glabrous above, minutely papillose and finely pubescent or glabrous beneath; *petiole* 1-4.5 in. long; *stipules* ovate-lanceolate, pubescent, about .6 in. long. *Receptacles* globose or sub-pyriform about 1 in. diameter, pedunculate, in clusters on very much shortened leafless branches or tubercles from the main stem and larger branches, pubescent; *peduncle* .5-1.5 in. long, puberulous; *basal bracts* 3, ovate, acute. *Male flrs.* near the mouth of the receptacle; *sepals* 3, enclosing the anthers; *anthers* 2, curved. *Female* and *Gall flrs.* : *perianth* gamophyllous, 3-toothed; *style* lateral; *stigma* clavate.

Swampy localities in the Dun, e.g., Gola Tappar, Khairi-Fl. Rainy season.

F. pumila, Linn.; Brandis Ind. Trees 609. A climbing shrub clinging close to walls by means of adventitious roots; fruiting branches erect or spreading, not rooting. pubescent when young. *Leaves* up to 3 in. long, ovate or ovate-elliptic, coriaceous, entire,

subacute at the apex, unequal-sided and cordate at the base, lateral nerves 4-5 pairs, depressed above, prominent beneath; *petiole* up to .4 in. long; *stipules* ovate-lanceolate, pubescent. *Receptacles* solitary, axillary, pyriform, about 2 in. long.—Indigenous to China and Japan; frequently cultivated against walls and other buildings in Dehra Dun.

Ficus elastica, Roxb.; Fl. Br. Ind. 508; Brandis Ind. Trees 603. The India-rubber or Caoutchouc-tree. A large glabrous evergreen tree with buttressed trunk and numerous aerial roots hanging from the branches. *Leaves* 5-10 in. long usually elliptic, shortly acuminate, dark-green and glossy, coriaceous, with numerous fine parallel lateral nerves and pink stipules up to 6 in. long. *Receptacles* sessile, axillary, enclosed white young by hooded involucre which fall off leaving a saucer-shaped basal cup under the receptacle. It is a native of the Outer Himalaya, Assam, Khasi Hills and Burma and has been successfully cultivated in Dehra Dun and Saharanpur.

9. Cudrania, Trecul.

1. *C. javanensis*, Trecul; Fl. Br. Ind. v. 538; Brandis For. Flora 424, Ind. Trees 614; Gamble Man. Ind. Timb. 651. Vern. *Mānda*, *Dammar*, Dūn.

A straggling shrub, armed with axillary spines; bark smooth, yellowish-brown, with white oblong lenticels, profusely exuding a pale milk when cut. *Leaves* alternate, 1-4 in. long, oblong elliptic obovate or oblanceolate, obtuse to acuminate, entire, penninerved; nerves not prominent; petiole .2-.3 in. long. *Flowers* dioecious, in globose heads. MALE FLS.: *sepals* usually 4, oblong, imbricate. *Stamens* 4, erect, included. FEMALE FLS.: *sepals* broader than in the male. *Ovary* straight; style terminal, simple but with a short rudimentary branch at the base. *Flower-heads* solitary or in pairs, pubescent; male .2-.3 in. diam.; female smaller at first, .7-1.2 in. diam. in fruit. *Fruit* an irregularly shaped compound berry, marked outside in a regular pattern by the thickened tips of the perianth-lobes, pinkish-orange when ripe; peduncle .2-.3 in. long; seeds nearly as many as the flowers in the female heads, elliptic, compressed; testa black, crustaceous.

Common in the EASTERN DŪN; also in shady ravines in the SIWALIKS.

Wood tough; heartwood scanty, deep-yellow. The ripe fruit, which has a mawkish sweet taste, is eaten. The leaves are often attacked by a fungus which converts the inner substance into a white brittle mass. This is called *mande-ki rôti* and is eaten by village boys.

Fl. Apr.-June. Fr. Aug.-Nov.

In the same Tribe, and allied to *Cudrania*, is the somewhat large Genus, *Artocarpus*, Forst, noted for important timber trees, of which, however, none are indigenous in the region of this Flora. Only the following two trees are cultivated in gardens :—

1. *A. integrifolia*, Linn. f.; Fl. Br. Ind. v. 541. The Jack-tree. Vern. *Kanthál*, *Kathál*, *Kathár*, Hind. A large evergreen tree noted for its dark-green foliage, and huge echinate fruit, which is eaten when ripe or cooked while raw. The wood, which somewhat resembles mahogany, is used for carpentry, and is exported to Europe for various purposes. A yellow dye is extracted from it in Assam and Burma, which is used for dyeing silk.

2. *A. Lakoccha*, Roxb. ; Fl. Br. Ind. v. 543. Vern. *Dheú*, Dún ; *Barhál*, Hind.—A large evergreen tree. *Leaves* large, dark-green, tomentose beneath. *Fruit* 3-4 in. diam., velvety, yellow when ripe. The wood resembles that of the Jack-tree, though somewhat inferior. The male flower-heads are pickled, and the fruit is eaten both when ripe, and also cooked into a curry while raw. Occasionally probably wild in damp localities, e.g., Nakraunda and Khairi swamps in the Dén.

V. URTICEÆ.

10. *Bœhmeria*, Jacq.

Shrubs or small trees. *Leaves* opposite or alternate, toothed, 3-nerved ; nerves penniveined. *Flowers* unisexual, in clusters which are axillary or arranged in interrupted axillary spikes racemes or panicles. MALE : *Perianth* 3-5-lobed, valvate ; *stamens* 3-5, inflexed in bud ; *pistillode* globose. FEMALE : *Perianth* tubular, narrowed to a 2-4-toothed mouth ; *stigma* lateral, filiform, persistent. *Achenes* crustaceous, at length free and dry.

Analysis of the Species.

- | | |
|------------------------------------|----------------------------|
| Leaves alternate. A tree . . . | 1. <i>B. rugulosa</i> . |
| Leaves opposite. Shrubs. | |
| Leaves lanceolate, petiole short . | 2. <i>B. macrophylla</i> . |
| Leaves broad-ovate, petiole long . | 3. <i>B. platyphylla</i> . |

1. **B. rugulosa**, Wedd. : Fl. Br. Ind. v. 577 ; Brandis For. Flora 403, Ind. Trees 617 ; Gamble Man. Ind. Timb. 657. Vern. *Genthi*, *Genti*, Dún and Garhwal.

A middle-sized or small tree. *Leaves* 3-6 by 1-2 in., alternate, elliptic-lanceolate, closely crenulate or dentate, acuminate, glabrous and dark-green above, pale and velvety beneath, strongly 3-nerved at the base, the nervules anastomosing in an elegant pattern beneath, and forming an intramarginal vein ; petiole .7-1.5 in. ; stipules connate. *Clusters* of flowers sessile, in simple spikes, each in the axil of a cordate bract ; spikes axillary, 3-8 in. long. *Perianth* compressed, ciliate. *Achenes* stipitate, acute at both ends.

Ravines in the OUTER HIMALAYA, up to 4,000 ft. and occasionally along Sub-Himalayan streams : Rájpur, Kálsi, Málkót, banks of the Sông down to Misirwála, etc.

Wood reddish-brown, moderately hard, even-grained, seasons well, mottled on a radial section. It is easy to cut and work, and is used in the hills for making bowls and various kinds of dairy-utensils.

Fl. Rainy season. Fr. Cold season.

2. **B. macrophylla**, Don : Fl. Br. Ind. v. 577 ; Brandis For. Flora 403, Ind. Trees 617 ; Gamble Man. Ind. Timb. 658. Vern. *Bará Siáru*, Dún.

A large shrub or small tree with dark-brown bark ; branchlets 4-sided, strigose. *Leaves* opposite, 6-12 by 2-3.5 in., lanceolate, very gradually tapering caudate-acuminate, evenly serrulate, acute or rounded and 3-nerved at the base, hispid, rugulose and pustular above, pubescent beneath ; petiole .6-1 in. long, strigose ; stipules lanceolate. *Flowers* monœcious, in long drooping simple axillary spikes often as long as the leaves ; clusters .2-3 in. diam., subtended by lanceolate bracts. *Fruit* obovate-cuneate, compressed, ciliate.

OUTER HIMALAYAN slopes, e.g., above Rájpur, and in ravines round the Nágsidh Hill in the DÚN ; not very common.

The branches yield a strong fibre which is used for fishing lines, nets, and such other purposes.

Fl. Aug., Sept. Fr. Nov.-Jan.

3. **B. platyphylla**, Don : Fl. Br. Ind. v. 578 ; Brandis For. Flora 403, Ind. Trees 617 ; Gamble Man. Ind. Timb. 658. Vern. *Bimol*, Rájpur ; *Siár*, Kálsi ; *Khákshá*, Garhwal.

A shrub, often up to 10-12 ft. high, branches rough, dark-brown. *Leaves* usually opposite, 4-9 by 3-7 in., broad-ovate or

orbicular, acuminate or caudate, closely dentate, scaberulous or glabrate, rather membranous; base cordate or rounded; margins and teeth strongly reticulate; petiole 1.5-8 in. long. *Flowers* whitish, monœcious or diœcious. *Male spikes* often branching, generally not exceeding the leaves. *Female spikes* (in the typical form) much exceeding the terminal leaves, brown when the achenes are dry. *Fruit* compressed or angled.

Common in the OUTER HIMALAYA, and in shady ravines and along streams throughout the DÚN.

Wood moderately hard, but hardly of any size to be of much use except for fuel. The bark yields a shining-white strong fibre, very good for rope, and probably also for textile purposes. The leaves make a good fodder for cattle.

Fl. Apr.-Aug. Fruiting spikes Oct.-Dec.

I have noticed two distinct varieties of this plant in the DÚN : one the typical form described above, with long slender flexuose fruiting spikes; and the other, a small undershrub, with rougher and thicker leaves, and shorter, stouter and erect fruiting spikes :—
Var. *scabrella*, Wedd. sp. Gaud.

11. *Pouzolzia*, Gaud.

1. *P. viminea*, Wedd. : Fl. Br. Ind. v. 581; Brandis For. Flora 405, Ind. Trees 617; Gamble Man. Ind. Timb. 658.

A shrub with slender branches; bark thin, rough, grey. *Leaves* alternate, 1-6 by .2-1.5 in., oblong or ovate-lanceolate dentate or serrate, acuminate, rather rough above, somewhat hirsutely grey-tomentose beneath; base rounded, strongly 3-nerved; nerves penniveined; petiole .3-1.5 in. long. *Flowers* usually monœcious, bracteate, in sessile axillary clusters. **MALE FLS.** : *Perianth* 4-5-partite, segments valvate; stamens usually 4, inflexed in bud. **FEMALE FLS.** : *Perianth* tubular, narrowed and toothed above; stigma lateral, filiform, deciduous. *Achenes* enclosed in the persistent chaffy perianth.

Occasionally met with in moist shady ravines in the DÚN and in JAUNSAK. Nakraunda and Gángbhewa swamps; banks of the Tons near Kálsi, etc.

The wood is not of much use except for fuel. The leaves are eaten cooked in Sikkim, and the bark is used to make ropes.

Fl. Rainy season.

12. **Villebrunea**, Gaud.

1. **V. frutescens**, Bl. : Fl. Br. Ind. v. 590 ; Brandis For. Flora 406, Ind. Trees 618 ; Gamble Man. Ind. Timb. 659. Vern. *Gartushiārā*, *Poi-dhauā*, Kumaun.

A shrub with slender pubescent branches : bark dark-grey, rough. *Leaves* alternate, 3-6 by 1·5-3·5 in., ovate or elliptic, acuminate, finely serrate or crenate, membranous, concolor or grey beneath, sparsely strigose or glabrate, penninerved in the upper half ; base rounded or slightly sub-cordate, 3-nerved ; petiole 1·5-3 in. long, very slender ; stipules lanceolate. *Flowers* usually dioecious, in subsessile clusters or short cymes in the axils of previous year's leaves. *Male perianth* valvate. *Female perianth* and bracteoles fleshy and juicy in the ripe fruit.

JAUNSAAR and DEHRA DŪN. up to 5,000 ft., generally along water-courses ; fairly common. Dhārmigādh ; Nakraunda, etc.

The bark gives a useful fibre.

Fl. and Fr. Apr. and May to Sept. and Oct.

13. **Debregeasia**, Gaud.

Shrubs or small trees. *Leaves* alternate, serrate, 3-nerved ; stipules 2-fid. MALE FLS. clustered ; *sepals* generally 4, valvate ; *stamens* as many as the sepals, inflexed in bud ; *ovary* rudimentary. FEMALE FLS. in small fleshy heads ; *perianth* very minute, tubular, with a contracted mouth ; *ovary* straight, included ; *stigma* generally sessile, tufted. *Achenes* enclosed in the fleshy perianth ; heads succulent when ripe.

Analysis of the Species.

Flower-heads in dichotomous cymes ;

leaves ashy beneath, glabrous above
when mature

1. *D. velutina*.

Flower-heads sessile or subsessile ; leaves

white beneath, scabrous above when
mature

2. *D. hypoleuca*.

1. *D. velutina*, Gaud. ; Fl. Br. Ind. v. 590 ; Brandis Ind. Trees 618 ; Gamble Man. Ind. Timb. 660. Syn.—*D. longifolia*, Wedd. ; Brandis For. Flora 405. Vern. *Túshiári*, Dún ; *Sansáru* E. Dún ; *Siáru*, Mussoorie.

A moderate-sized shrub ; bark thin, dark-brown. *Leaves* 3-5 by 4-1 in., oblong or linear-elliptic, acute at the base, acuminate, serrulate, rugose, glabrous and dark-green above when mature, ashy-tomentose beneath ; petiole up to 1 in. long. *Flowers* monœcious (*Sir D. Brandis*), in small heads which are disposed in short sessile dichotomous cymes. *Male perianth* longer than the bracteoles. *Heads* yellow when ripe, with numerous minute nuts imbedded in it.

OUTER HIMALAYAN Valleys and the DÚN ; also at low elevations in JAUNSAAR and TEHRI-GARHWAL ; Dúdhli, Sansáru Khálá, above Rájpur ; Bámsu, etc.

The stem yields a strong fibre which is made into rope. The ripe fruit is eaten.

Fl. July, Aug. Fr. Nov.-Jan.

2. *D. hypoleuca*, Wedd. ; Fl. Br. Ind. v. 591 ; Brandis Ind. Trees 618 ; Gamble Man. Ind. Timb. 660. Syn.—*D. bicolor*, Wedd. ; Brandis For. Flora 405. Vern. *Túshiári*, Garhwal and the Dún ; *Sansáru*, E. Dún ; *Siár*, *Siár*, Jaunsar ; *Siáru*, Mussoorie.

A large evergreen shrub with pubescent branches : bark thin, dark-grey. *Leaves* alternate, 3-6 by 5-1-2 in., oblong-or linear-lanceolate, acuminate, serrulate, rather coriaceous, scabrous and with round elevated dots above, thickly white-felted beneath : base acute or rounded, 3-nerved, the midrib much stouter than the two side-nerves ; lateral nerves 3-5 pairs above the basal ; petiole 1-1 in. *Flowers* generally dioecious, in sessile or subsessile axillary heads. *Female perianth* ovoid, succulent in fruit. *Stigma* sessile, tufted. *Fruit* amber-coloured and berry-like, studded with the minute nuts (somewhat resembling strawberry), sweet, but insipid and mucilaginous.

Common along watercourses in the OUTER HIMALAYA and also in JAUNSAAR and TEHRI-GARHWAL, generally between 2,000 and 5,000 ft., sometimes ascending to 6,500 ft. (*e.g.*, Lúrlí Block, Chakratá ; also Mussoorie). Extremely abundant in the Sansáru Khálá, MÁLKÓT FOREST, 3,500 ft. which has been named after it.

The wood is grey, soft and light, not of much use. The fibre is made into twine and rope, and the ripe fruit is eaten.

Fl. Mar., Apr. Fr. June-Aug.

14. *Maoutia*, Wedd.

1. *M. Puya*, Wedd. ; Fl. Br. Ind. v. 592 ; Brandis For. Flora 406, Ind. Trees 619 ; Gamble Man. Ind. Timb. 660. Vern. *Poi*, *Puá*, Hind. *Dhaul* (white) *Khágshi*, Dún ; *Cháwá*, Kálsi.

A shrub with hairy shoots ; bark dark-grey, with vertical lines of brown lenticels. *Leaves* alternate, 4-8 by 2-2.7 in., elliptic, caudate-acuminate, coarsely dentate or crenate with 15-20 teeth on either side, membranous, scabrid above, softly white-felted beneath ; base rounded or sub-acute, 3-nerved ; lateral nerves 3-4 pairs ; veins transverse ; petiole .5-4 in. long, slender, pubescent, *Flowers* monœcious or diœcious, very minute, in small heads which are disposed in axillary dichotomous cymes or panicles ; inflorescence generally with a small rudimentary branchlet bearing minute leaves at the same leaf-axil. *Male sepals* 5, valvate. *Stamens* 5, inflexed in bud. *Female perianth* none. *Nuts* triquetrous.

Fairly common in the SUB-HIMALAYAN RAVINES ; Banks of the Tons Ráu (DEHRA DÚN), Kálsi, Paléd, etc. Also in the SIWALIKS, e.g., the Mohand Pass.

The plant gives a fine white strong fibre, which is used for making fishing-nets, twine and cloth.

Fl. and Fr. May-Nov.

In the same Tribe, URTICEÆ, are several Genera of annual or perennial herbs with stinging hairs commonly known as Nettles, which are fairly well represented in the region of this Flora. The Nettles are remarkable for strong fibres. The largest is *Girardinia heterophylla*, Don. ; Fl. Br. Ind. v. 550. Vern. *Bichchhú*, Hind. ; *Kúshki*, Jaunsar. Common throughout the DÚN and in the HILLS, especially about Kulni in TEHRÍ-GARHWÁL.

Belonging to quite a small Section of URTICACEÆ, which is destitute of woody plants, is the wild Hemp, *Cannabis sativa*, Linn., Fl. Br. Ind. v. 487. Vern. *Bháng*, Hind.—an annual weed of camping grounds and roadsides in the DÚN, but is also found in all camping places throughout the HILLS. *Leaves* palmatipartite, lobes finely serrate. It gives a strong fibre, quite fit for rope.

LXXIX. JUGLANDACEÆ.

Trees, often strongly aromatic. *Leaves* alternate, pinnate, exstipulate. *Flowers* monœcious, bracteate.

MALE FLS. in lateral catkins. *Perianth* flat, 3-6-lobed adnate to the supporting bract which is stipitate. *Stamens* 2-40, on lateral bracts; filaments short; anther-cells parallel. FEMALE FLS. subsolitary or spicate. *Calyx* adnate to the ovary; limb superior, 4-toothed. *Petals* minute or none. *Ovary* 1-celled, 1-ovuled; style 2-fid. *Fruit* a 1-seeded, 2-valved nut or drupe; cotyledons contorted or corrugated.

Analysis of the Genera.

Fem. fl. subsolitary; bracts not enlarged in fr.	1. JUGLANS.
Fem. fl. spicate; bracts produced into a wing in fr.	2. ENGELHARDTIA.

1. *Juglans*, Linn.

1. *J. regia*, Linn.; Fl. Br. Ind. v. 595; Brandis For. Flora 497, Ind. Trees 619; Gamble Man. Ind. Timb. 662. The Walnut. Vern. *Ākhrōt*, Hind.; *Akhōr*, *Okhār*, Jaunsar.

A large aromatic deciduous tree with velvety shoots; bark grey, longitudinally fissured. *Leaves* imparipinnate, 6-15 in. long, thickly tomentose while young. *Leaflets* 5-13, lateral subsessile, opposite or subopposite, 3-8 by 2-4 in., elliptic-oblong, generally entire, rather coriaceous, glabrescent or pubescent along the nerves beneath; lateral nerves 15-20 pairs. *Male catkins* green, 2-5 in. long, sometimes in pairs, in the axils of previous year's leaves; bracts stalked, oblong, lobed. *Stamens* 10-20 or more. FEMALE FLS. 1-3, opposite the terminal leaf. *Calyx* indistinctly 4-toothed. *Petals* 4, green, narrow-lanceolate, minute, in the sinuses between the calyx-teeth. *Stigmas* more or less fleshy. *Fruit* 2 in. long, ovoid, glabrous or pubescent, green, with yellow dots; pericarp leathery, very aromatic. *Nut* 1-1.5 in. long, ribbed, more or less thick-shelled, 2-valved; cotyledons irregularly corrugated, 2-lobed at the back, oily.

Wild throughout JAUN SAR and TEHRI-GARHWAL, between 4,000 and 10,000 ft., and generally cultivated about villages in the HILLS.

Heartwood greyish-brown with darker streaks, often mottled, even-grained, moderately hard, seasons and polishes well; weight

40-50 lbs. per c. ft. It is in great demand for gun-stocks and is used for ornamental furniture throughout the Himalaya. The bark is used as a dye and in medicine, and is exported to the plains for cleaning the teeth. The nut is a well-known article of commerce, and the rind of the unripe fruit is used to intoxicate fish, and for tanning and dyeing. The leaves are used for cattle-fodder. The tree attains an enormous size, as much as 100 to 120 feet in height and 28 feet in girth. The cultivated trees, however, have a low spreading crown not more than 50 feet high, and a short trunk about 8 or 10 ft. in girth.

Leafless in cold weather. New leaves and fl. Feb.-Apr. Fr. July-Sept.

2. Engelhardtia, Leschen.

1. *E. Colebrookiana*, Lindl.; Fl. Br. Ind. v. 596; Brandis For. Flora 499, Ind. Trees 620; Gamble Man. Ind. Timb. 664. Vern. *Mowá*, *Mauwá*, Jaunsar (Tons Valley).

A small deciduous tree with grey bark: young shoots tomentose. *Leaves* imparipinnate, 8-12 in. long. *Leaflets* 6-11, the terminal smallest, often absent (by abortion), the lateral subopposite, short-petioluled, 3-5 in. long, obovate or elliptic-oblong, obtuse or acute, entire, subcoriaceous, glabrescent above, densely tomentose beneath; main lateral nerves 8-12 pairs; base unequal-sided, sometimes half acute and half rounded. *MALE FLS.* in cylindrical lateral catkins, or exceptionally at the lower half of female spikes. *Perianth* 3-6-lobed, adnate to a 3-lobed stipitate bract. *Stamens* 4-12; filaments very short. *FEMALE FLS.* in drooping bracteate spikes 5-8 in. long. *Calyx* adnate to the ovary, 4-toothed. *Stigmas* 2, linear, papillose. *Fruit* small globose nut, 2-3 in. diam., villous, adnate to the much enlarged 3-lobed bract; lobes of bract with a straight midrib and reticulate veins; middle lobe 1-1.3 in. long; lateral lobes .7 in. long.

Common and often gregarious in the MALKÖT and MUSSOORIE HILLS and in the Tons Valley, JAUNSAAR, and also, according to Sir D. Brandis, in the SIWALIK TRACT and N.-W. HIMALAYA, up to 6,500 ft., but has not, so far, been met with in the SARÁNANPUR-SIWALIKS or anywhere above 5,000 ft. in the region of this Flora.

The wood is reddish-grey, even-grained, moderately hard, seasons and polishes well, but is not durable: weight 33 lbs. per c. ft. The leaves and branches are burned for use as manure.

Leafless Dec.-Feb. New leaves and fl. Mar., Apr. Fr. May, June.

LXXX. MYRICACEÆ.

Aromatic trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* monœcious or diœcious, in bract-eate catkin-like spikes. *Perianth* none. **MALE FLS.** : *Stamens* generally 3-6, on a torus adnate to the bract ; filaments free or connate at the base. **FEMALE FLS.** ; *Ovary* sessile, 1-celled, 1-ovuled ; style 2-fid. *Fruit* a resinous drupe with a hard endocarp. *Ovule* erect, orthotropous, exalbuminous.

1. *Myrica*, Linn.

1. **M. Nagi**, Thunb. : 7l. Br. Ind. v. 597. Brandis Ind. Trees 620 ; Gamble Man. Ind. Timb. 664. Syn.—*M. lapida*, Wall. ; Brandis For. Flora 495, Vern. *Káiphal*, Hind. ; *Káphal*, Jaunsar.

A moderate-sized evergreen tree ; bark brownish-grey, rough, vertically wrinkled. *Leaves* 3-7 by 1-2 in., lanceolate oblanceolate or obovate, obtuse or acute, serrate on young plants, entire on old trees, coriaceous, glabrous above, pale or rust-coloured and with resinous dots beneath ; midrib stout ; main lateral nerves 12-20 pairs, anastomosing at the ends to form an intramarginal vein ; base very acute ; petiole .3-.6 in. long. *Male spikes* usually racemose on a common peduncle, sometimes with female flowers at the top. *Female spikes* axillary, slender. *Fruit* .5 in. long, ellipsoid or ovoid somewhat compressed, tubercled, reddish or yellowish-brown when ripe ; pulp reddish, formed of radiating fleshy hairs ; nut rugose.

JAUNSAAR and TEHRI-GARHWAL, 3,-6,000 ft. ; Korwá, 6,000 ft. ; Gádhs in the Tons Valley ; etc. Also MÁLKŌT HILLS, 4,-5,000 ft.

The wood is purplish-grey, hard and close-grained, but apt to split and warp ; weight 58 lbs. per c. ft. It is good for fuel. The bark is used as an aromatic stimulant, and externally as a plaster for rheumatism. It is also used to poison fish. The fruit is eaten and makes a very refreshing sherbet in the hot weather when it ripens.

New leaves Apr., May. Fl. Oct.-Dec. Fr. May, June.

LXXXI. CUPULIFERÆ.

Trees or shrubs. *Leaves* alternate, simple, stipulate. *Flowers* generally monœcious. **MALE FLS.** in catkin-

like spikes; *sepals* 1-5, or absent; *stamens* 2-20, on a hairy torus. FEMALE FLS. solitary or in dense spikes or heads; *perianth* adnate to the ovary, or absent; *ovary* 2-3-rarely more-celled; style-arms as many as cells in the ovary; ovules 1 or 2, pendulous. *Fruit* included within or in the axils of enlarged bracts; seed pendulous, exalbuminous.

This Family includes the following Tribes represented in the area covered by this Flora by the Genera analysed under them:—

I. BETULÆ.—*Male perianth* of 4 or fewer segments; *fem. perianth* absent. *Female flowers* many in dense spikes. *Ovary* 2-celled; cells 1-ovuled.

Scales of female spikes thin, deciduous 1. BETULA.

Scales of female spikes woody, persistent 2. ALNUS.

II. CORYLÆ.—*Male perianth* absent; *female perianth* adnate to the ovary. *Female flowers* in pairs in the axils of bracts that are much accrescent in fruit. *Ovary* 2-celled; cells 1-ovuled.

Bracts many, in long spikes, leafy and veined in fruit 3. CARPINUS.

Bracts few, in very short spikes, coriaceous in fruit 4. CORYLUS.

III. QUERCINÆ.—*Male perianth* 4-10-lobed; *female perianth* adnate to the ovary. *Female flowers* few in an involucre of bracts. *Ovary* 3-7-celled; cells 2-ovuled.

Bracts many, small, adpressed, usually imbricate 5. QUERCUS.

I. BETULÆ.

1. *Betula*, Tourn. (The Birch)

Deciduous trees or shrubs; outer bark papery, peeling off in horizontal rolls. *Leaves* penninerved, toothed or serrate; stipules deciduous. *Flowers* monœcious,

spicate. MALE SPIKES drooping; *bracts* stalked, peltate, bearing on the inner face 2-3 bracteolate flowers; *sepals* 2-4. *Stamens* 2; filaments forked, separating the anther-cells. FEMALE SPIKES erect or pendulous; *bracts* imbricate, each with two bracteoles on either side; *perianth* none. *Ovary* compressed; styles 2; stigmas terminal. *Fruit* a 1-seeded winged lenticular nut.

Analysis of the Species.

Female spikes sub-solitary, erect;
bracts coriaceous, wider than the
wings of the nut 1. *B. utilis*.

Female spikes usually paniced, sub-
erect; bracts membranous, narrower
than the wings of the nut 2. *B. alnoides*.

1. ***B. utilis***, Don.; Fl. Br. Ind. v. 599; Brandis Ind. Trees 622; Gamble Man. Ind. Timb. 668. Syn.—*B. Bhojpattra*, Wall.; Brandis For. Flora 457. Vern. *Bhájpattra*, Hind.; *Bháj*, Jaunsar and Garhwal.

A moderate-sized tree; bark brownish-white, with numerous horizontal lenticels; extremities pubescent. *Leaves* 2-3 by 1-5-2-2 in., ovate, acuminate, irregularly serrate, pubescent when young, gland-dotted and hairy along the nerves beneath; lateral nerves 8-12 pairs; petiole .3-.6 in.; stipules oblong, .5 in. long. *Bracts* of male fls. ciliate, stalk scaly; anther-cells distinct. *Bracts* of female fls. pubescent, 3-lobed, hardened in fruit. *Male spikes* 4-5 in. long, .2-.3 in. diam. *Female spikes* erect, 1-2 in. long, .5-.6 in. diam. *Nut* with narrow wings.

TEHRI-GARHWAL, between 10,000 and 14,000 ft. and occasionally in JAUN SAR. Gregarious in higher elevations with *Rhododendron Anthopogon* as an undershrub, e.g., at Cháchpur, Chánsil, Harki-Dún and Gangottari. Sporadic specimens occur at such places as Bhújkoti; Deotá, Lambátách Peak, etc.

The wood is pinkish-white, even-grained, tough and elastic; weight 44 lbs. per c. ft. It seasons well and does not warp, and is used for building in the inner arid Himalaya. The bark, however, is by far the most valuable part of the tree. It is used as paper for writing and packing, for umbrella covers, as a lining

inside hooka-tubes, and for roofing houses. The leaves are lopped for cattle-fodder.

Leafless Oct.-Mar. New leaves and fl. Apr., May Fr. Aug-Oct.

2. **B. alnoides**, Ham.; Fl. Br. Ind. v. 599; Brandis Ind. Trees 622; Gamble Man. Ind. Timb. 669. Syn.—*B. acuminata*, Wall.; Brandis For. Flora 458. Vern. *Kath Bhúj*, Jaunsar.

A moderate-sized tree; young shoots pubescent; rolls of bark thicker and lenticels shorter than in the last species. *Leaves* 3-6 by 2-3.5 in., ovate or ovate-lanceolate, sharply acuminate, very irregularly and doubly serrate, pubescent beneath when young, gland-dotted when old; lateral nerves 10-15 pairs; base from rounded to cordate; petiole .5-.7 in. long, hairy; stipules lanceolate, .3 in. long. *Bracts, stamens* and *ovary* hairy: male bracts sub-sessile. *Male* and *female spikes* fascicled or paniced or the latter sometimes solitary, of nearly the same size, 2-5 in. long, .2-.3 in. diam. *Nut* with wings broader than itself.

Fairly common in JAUN SAR and TEHRI-GARHWAL, 5-10,000 ft., with a somewhat gregarious tendency (e.g., Tutuágádh, Mundáli).

The wood is white, fairly close-grained, but not very hard in Jaunsar, although esteemed for strength and durability in Nepal. Weight 41 lbs. per c. ft. The leaves are lopped for fodder. The bark, peeling off in somewhat stiff narrow bands, cannot be used in the same way as that of the preceding species.

Leafless in winter. Fl. Nov., Dec. Fr. Apr., May.

2. **Alnus**, Tourn.

The Alders.

Deciduous trees. *Leaves* alternate, penninerved often with tufts of hairs beneath in the axils of the lateral nerves. *Flowers* monœcious. MALE FLS. in pendulous spikes, supported by bracts and bractéoles; *bracts* 3-fid; *sepals* 4. *Stamens* 4; anthers subsessile, cells connate. FEMALE FLS. 2 in the axil of each bract, in short-erect spikes; *bracts* woody, persistent in fruit. *Styles* 2, stigmatose at the tips. *Fruit* a woody cone; nuts more or less winged.

Analysis of the Species.

- Bark smooth, silver-grey; fruiting spikes
 many, in large erect panicles . . . 1. *A. nepalensis*.
 Bark furrowed, brown; fruiting spikes
 solitary or 3-5 in. short erect raceme . . . 2. *A. nitida*.

1. ***A. nepalensis***, Don; Fl. Br. Ind. v. 600; Brandis For. Flora 460, Ind. Trees 623; Gamble Man. Ind. Timb. 670. Vern. *Puzāla*, Jaunsar; *Kūnis*, Tehri-Garhwal.

A large tree; branchlets glabrous; bark compact, silvery grey. *Leaves* 3-7 by 2-3·5 in., elliptic or elliptic-lanceolate, acute, entire or denticulate, glabrous above, slightly glaucous beneath; nerves 10-18 pairs; base usually narrowed; petiole generally ·3-·5 in., sometimes much longer. *Male spikes* 4-10 in. long, short-peduncled, slender, in terminal drooping panicles. *Fem. spikes* 2-3 in., pendulous in flower. *Fruit spikes* 5-1 by ·3 in., ovoid or cylindrical, short-peduncled, in lateral panicles. *Nuts* with a membranous wing.

JAUN SAR and TEHRI-GARHWAL, 3—8,000 ft.: Chakrata, Lambátách, Deotá, Tons Valley, etc. Generally in ravines or banks of streams.

Wood reddish-white, close and even-grained, soft but tough. Medullary rays broad, with numerous fine ones between. Weight about 30 lbs. per c. ft. It is used for bedsteads and for the hooked sticks in rope bridges. The bark is used for dyeing and tanning.

Fl. Oct.-Dec. Fr. ripens in winter but remains long on the tree.

2. ***A. nitida***, Endl.; Fl. Br. Ind. v. 600; Brandis For. Flora 460, Ind. Trees 623; Gamble Man. Ind. Timb. 670. Vern. *Utis Kūnis*, Jaunsar.

A large tree; new shoots and petioles pubescent; bark dark-brown, deeply furrowed. *Leaves* 4-5 by 2-3·5 in., elliptic or elliptic-ovate, acuminate, entire or obscurely crenate, glabrous; nerves 8-12 pairs; base generally cuneate; petiole 1-1·5 in. *Male spikes* 2-4 in. long, in erect terminal racemes; peduncle ·3-·6 in. *Female spikes* 1-2 by ·7 in. *Fruit spike* 7-1·5 by ·5 in., ovoid, in erect racemes. *Nuts* with a thickened margin.

JAUN SAR and TEHRI-GARHWAL, usually at low elevations, generally fringing the banks of rivers and streams, e.g., the Tons and Pábar Rivers; Thádiar, Morágádh, etc.

Wood similar to that of *A. nepalensis*, but somewhat lighter. The economic uses also are the same as of that species.

Fl. Sept., Oct. Fr. ripens in winter but remains long on the tree.

II. CORYLÆ.

3. *Carpinus*, Tourn.

The Himalayan Hornbeams.

Deciduous trees with slender flexuous branchlets. *Leaves* alternate, membranous, serrate; lateral nerves many, straight, parallel, very regular; buds elongate. *Flowers* monœcious. MALE FLS. in drooping lateral spikes, ebracteolate; *perianth* none; *stamens* 3-4 on a hairy torus, filaments forked, separating the anther-cells. FEMALE FLS. in slender terminal spikes, in pairs at the base of a foliaceous bract; bracteoles 2; *perianth* superior; *ovary* 2-celled, 2-ovuled; *style-arms* 2, filiform. *Nut* ribbed, at the base of the much-enlarged leafy bract and bracteoles.

Analysis of the Species.

- | | |
|--|------------------------|
| Leaves ovate-lanceolate, caudate; fruiting bracts lanceolate; branches verrucose | 1. <i>C. viminea</i> . |
| Leaves ovate-oblong, acute; fruiting bracts triangular; branches soft-tomentose | 2. <i>C. faginea</i> . |

1. *C. viminea*, Wall.; Fl. Br. Ind. v. 626; Brandis For. Flora 492, Ind. Trees 623; Gamble Man. Ind. Timb. 684. Vern. *Shinroi*, *Shángri*, Jaunsar; *Chamkharik*, Hind.

A middle-sized tree; branches warted; stem irregularly fluted; bark compact, grey, with darker streaks. *Leaves* 3-4 in., long, ovate-lanceolate, caudate-acuminate, doubly serrate up to the tip, glabrous; base rounded or sub-cordate; petiole .1-5 in. long, hairy. *Male spikes* 1-2 in.; *female* 2-4 in. long. *Fruiting bracts* 1 in. long, lanceolate, unequal-sided, toothed on the broader side, often lobed at the base on the other side, 3-5-nerved. *Nut* 1 in. long, glandular.

JAUNSAK and TEHRI-GARHWAL, 5,-7,000 ft. often in shady ravines and along watercourses.

Wood white, shining, moderately hard, warps in seasoning, believed to be durable; no heartwood; weight 50 lbs. per c. ft. It is used chiefly for fuel.

Fem. fl. and new leaves Mar., Apr.; male fl. shortly before the leaves.

2. *C. faginea*, Lindl.; Fl. Br. Ind. v. 626; Brandis For. Flora 492, Ind. Trees 623; Gamble Man. Ind. Timb. 684. Vern. *Gish*, Garhwal; also the names given to the last species.

A middle-sized tree; branches pubescent; bark dark-brown smooth, slightly wrinkled. *Leaves* 3-5 in. long, ovate-oblong, often falcate, acute, generally with simple serratures, glabrescent; base rounded or sub-cordate, sometimes oblique; petiole 1-3 in., long, hairy. *Male spikes* 1-2 in., *fem.* 2-3 in. long. *Fruiting bracts* 6-7 in. long, 4-6-nerved, pubescent along the nerves beneath, triangular-oblong, very unequal-sided, coarsely toothed and often also lobed on the broader side. *Nut* 1 in. long.

Between 6,000 and 7,000 ft. in TEHRI-GARHWAL: Kulni Sāhīrā, Upper Tons Valley. Rather rare in JAUNSAK.

Wood similar to that of the last species.

Fl. Mar. Apr. Fr. July, Aug.

4. *Corylus*, Linn.

1. *C. Colurna*, Linn.; Fl. Br. Ind. v. 625; Brandis For. Flora 494, Ind. Trees 624; Gamble Man. Ind. Timb. 684. The Himalayan Hazel. Vern. *Kapāsi*, *Shārōri*, Jaunsa; *Bhutiā Badām*, Hind.

A moderate-sized deciduous tree; bark dark-grey, thin, sometimes exfoliating upwards. *Leaves* 3-6 in. long, rather membranous, ovate or obovate, acuminate, often slightly lobed unequally and doubly serrate, glabrous when mature; lateral nerves 10-12 pairs, straight, generally pubescent beneath, each terminating in a large tooth; base cordate; petiole 7-15 in. long, glandular-pubescent; stipules 6 in. long, lanceolate, hairy; leaf-buds rounded in hairy ovate scales. *Flowers* monœcious. *MALE FLS.* 1 in each bract, *perianth* 0. *Stamens* usually 4; filaments forked, separating the anther-cells; spikes fascicled, 1-2 in. long, cylindrical, drooping. *FEM. FLS.* in pairs in the upper bracts of a small many-bracteate bud-like spikes; *perianth* superior. *Ovary* 2-celled, 2-ovuled. *Nuts* 1-seeded, 5-7 in. long, globose somewhat compressed, hard, deep-brown, 2-3 together in a ribbed coriaceous double-involucre.

JAUNSAK and TEHRI-GARHWAL, 5,500 to 10,000 ft., generally in shady places and northern aspects; not gregarious.

Wood pinkish-white, moderately hard; annual rings distinct; medullary rays fine, numerous; weight 35 lbs. per c. ft. It is used locally for various purposes. The fruit is as good as English Hazelnut, and is an important article of food in the hills, where the tree is cultivated for its sake.

New leaves and fl. Mar., Apr. Fr. July, Aug.

III. QUERCINEÆ.

5. *Quercus*, Linn.

The Oaks.

Deciduous or evergreen trees. *Leaves* alternate, penninerved, generally serrate. *Flowers* monœcious. MALE FLS. usually in drooping spikes; *perianth* campanulate; *stamens* 6-12 or more; filaments slender, anther-cells connate. FEMALE FLS. solitary or in clusters or short spikes, each enclosed in an involucre of bracts; *perianth-tube* adnate to the ovary; limb minutely toothed; *ovary* 3-5-celled with 2 ovules in each cell; *styles* 3-5. *Nut* (usually called an *acorn*) 1-celled, seated in a cup of hardened bracts; seeds 1 or 2; cotyledons thick, fleshy.

Analysis of the Species.

Cupular bracts imbricate, tips free.

Mature leaves rusty-tomentose beneath; fruit globose, less than half buried in the cup 1. *Q. semecarpifolia*.

Mature leaves glabrous, green beneath; fruit ovoid, half buried in the cup 2. *Q. dilatata*.

Mature leaves white-tomentose beneath; fruit conical, more than half buried in the cup 3. *Q. incana*.

Cupular bracts connate into concentric belts; leaves glaucous beneath 4. *Q. glauca*. 47

1. *Q. semecarpifolia*, Smith; Fl. Br. Ind. v. 601; Brandis For. Flora 479, Ind. Trees 625; Gamble Man. Ind. Timb. 671. Vern. *Kharshu*, Jaunsar.

A middle-sized or large tree, generally evergreen; young parts clothed with soft hairs; bark dark-grey, cracked into more or less 4-sided scales. *Leaves* 2-5 by 1-3 in., elliptic or oblong, spinous-toothed on young trees, often entire on old individuals, coriaceous, glabrous and dark-green above, generally rusty-tomentose beneath; lateral nerves 6-12 pairs, bifurcating, impressed above; base cordate or rounded; petiole 0-2 in. *Male spikes* crowded, 2-4 in. long and congested in seed-years, 4-8 in. long and interrupted in other years; *perianth-segments* obtuse, ciliate; *stamens* indefinite, anthers apiculate. *Fem. spikes* short, at the tip of the current year's shoots; *styles* long, recurved. *Acorn* solitary, on previous year's shoots, 1 in. diam., globose, black when ripe; cup .5 in. diam., thin, enclosing about a third of the nut.

JAUNSAR and TEHRI-GARHWAL, 8,500 to 10,000 ft., generally gregarious, often mixed with spruce and silver firs, occupying a higher zone than any other oak found in the N. W. HIMALAYA. It is the most important fuel-tree in the Deoban Range, CHAKRATA DIVISION.

Heartwood reddish-grey, very hard. Annual rings not very distinct. Medullary rays of two kinds; a few broad rays with numerous very fine ones between. Weight 53 lbs. per c. ft. The wood splits in seasoning. It is used only locally for building, door-frames, bedsteads, ploughs, and mule-saddles, and is a good fuel. It might, as also the wood of *M̄ru*, be useful in the plains, but they are too heavy to be floated. The leaves make a good cattle-fodder, and bears are extremely fond of the acorns. The tree coppices well. It seeds profusely every second or third year, but a few trees here and there produce acorns every year. Trees that bear acorns do not shed leaves that year, whereas those which produce male flowers are generally leafless by the middle of May.

New leaves and fl. May, June. The female flowers appear with the male flowers and become fertilized by their pollen, but the acorns begin to grow only in the next spring, often before the male flowers of the season have begun to open. By the first week of June the young acorns are about the size of a pea, while the female flowers (which will produce acorns next year) are then just visible. Fr. Aug., Sept.,—15 months after flowering.

2. *Q. dilatata*, Lindl.; Fl. Br. Ind. v. 602; Brandis For. Flora 482, Ind. Trees 627; Gamble Man. Ind. Timb. 673. Vern. *M̄ru*, Jaunsar.

A large shade-enduring tree, almost evergreen; bark dark-grey or black, peeling off in longitudinal scales. *Leaves* 1.5-3.5 by .5-1.7 in., oblong or oblong-lanceolate, acuminate, entire or spinous-serrate, coriaceous, quite glabrous when mature; lateral nerves 8-12 pairs, slender, forked and reticulate; base rounded or cordate; petiole .2-.3 in. long. *Male spikes* crowded, drooping, lax, 1.5-3 in. long; bracts lanceolate. *Fem. spikes* short; *styles* 3-5, linear-clavate. *Acorn* solitary, on previous year's shoots, .7-1.2 in. long, .5-.7 in. diam., ovoid or oblong, glabrous, brown when ripe; scales of cup closely adpressed.

JAUNSAR and TEHRI-GARHWAL, 6,500 to 9,000 ft., occupying a zone intermediate between that of *Bán* and *Kharshu*, often gregarious, but generally associated with the firs and Deodar.

Heartwood reddish-grey, with darker streaks, very hard, seasons well. The broader medullary rays are more numerous but narrower than those of any other species described here; the others very fine, very numerous, and uniform; annual rings indistinct; weight 61 lbs. per c. ft. The wood is the most useful of all the Oaks in the region of this Flora. It is used for building, for agricultural implements, axe-handles, walking-sticks, jhampán-poles, soles of sledges and similar other purposes. The leaves are lopped for fodder. The tree reproduces itself freely both from seed and from coppice-stools. A kind of gall-insect produces galls on the leaves, which are sweet to the taste, and are eaten by the Jaunsaris, insects and all.

New leaves and fl. Apr., May. Fr. Cold season,—16-18 months after flowering.

3. *Q. incana*, Roxb.; Fl. Br. Ind. v. 603; Brandis For. Flora 482, Ind. Trees 626; Gamble Man. Ind. Timb. 675. Vern. *Bán*, Jaunsar; *Bánj*, Garhwal.

A large evergreen tree; bark dark-grey, rough with cracks and fissures. *Leaves* 3-6 by 1-2 in., oblong or ovate-lanceolate, acuminate, mucronate-serrate, tough and coriaceous, young pinkish and woolly all over, mature dark-green and glabrous above, densely white or grey-rarely brownish-tomentose beneath; lateral nerves 12-20 pairs, straight, parallel; base acute; petiole .5-.7 in., long. *Male spikes* slender, drooping, 2-4 in. long, often much interrupted *perianth* 4-5-lobed; anthers glabrous. *Fem. fls.* axillary, sessile, solitary or clustered, on current year's shoots; *styles* linear-clavate, spreading. *Acorn* generally solitary, usually on current year's shoots; cup at first enclosing the nut, glabrate, rough, woody; nut .8 in. long, conico-ovoid, canescent, brown when ripe.

OUTER HIMALAYA, JAUNSAK and TEHRI-GARHWAL, between 4,000 and 8,000 ft., generally gregarious and associated with *Burāns* and *Ayār*. Also in the Mothronwāla swamp in the DŪN, 1,900 ft.

Heartwood reddish-brown, very hard, warps and splits in seasoning. Annual rings indistinct. Medullary rays of two kinds; a few very broad rays with numerous fine ones between. Weight 64 lbs. per c. ft. The wood is used locally for building, and for ploughs, and is a good fuel. The acorns are greedily eaten by bears, monkeys and squirrels, which is a drawback to its reproduction by seed. It coppices well up to about 9 in. diam.

New leaves and fl. Apr., May. Fr. Aug.-Oct.,—15-17 months after flowering, but remains on the tree throughout the cold weather.

4. *Q. glauca*, Thunb.; Fl. Br. Ind. v. 604; Brandis Ind. Trees 627; Gamble Man. Ind. Timb. 677. Syn.—*Q. annulata*, Sm. Brandis. For. Flora 487. Vern. *Ināi*, *Bāni*, Jaunsar; *Phanāt*; Garhwal.

A large evergreen tree; bark-grey, smooth up to pole stage, afterwards fissured and rough. Leaves 3-6 in. long, oblong or ovate-lanceolate, acuminate, cuspidate-serrate except near the base, coriaceous, glabrous and shining above, grey-pubescent when young, afterwards glaucous beneath; lateral nerves 12-14 pairs, straight, parallel; base acute; petiole .5-1 in. long. Male spikes hairy, very slender, drooping, bracts lanceolate, hairy, much longer than the flowers; perianth-segments 5, lanceolate. Female fls., sessile, 2-3 together on stout axillary peduncles, on the current year's shoots. Cup .5-.7 in. diam., of several thin concentric velvety belts of connate scales, sessile on last year's shoots; nut .6-.7 in. long, sub-globose or ovoid, half-buried in the cup.

Shady valleys in JAUNSAK and TEHRI-GARHWAL, 3-,5,000 ft., not conspicuously gregarious, often associated with Laurels and other evergreen trees. Abundant in the Lúnágádh and Mautárádh Valleys and their tributaries. Successfully cultivated in DEHRA.

The wood is grey or greyish-brown, tough and very hard, handsomely mottled, takes a good polish, but warps and cracks in seasoning. Medullary rays in broad irregular plates. Weight 60 lbs. per c. ft. It is used for much the same purposes as *Q. dilatata*, notably for soles of sledges in the Tehri-Garhwal Forests.

Fl. Mar.-June. Fr. Aug.-Oct., 15-17 months after flowering.

The following have been successfully cultivated and deserve mention :—

Quercus serrata, Thunb. Fl. Br. Ind. v. 601; Brandis Ind. Trees 626. A medium-sized deciduous tree with a straight stem.

Leaves 3-7 in. long by 1.25-2 in. broad, oblong-lanceolate, acute or acuminate, spinous-serrate, shining, glabrous when mature, generally with tufts of hairs in the nerve axils, secondary nerves 14-18 pairs, straight, each ending in a sharp serrature; *petiole* 1-1.5 in. long. *Fruiting bracts* imbricate, free, thick, coriaceous, recurved; *nut* shining, globose to oblong, .5-1 in. long, about half-exserted. Cultivated at Dehra Dun and Mussoorie. It is a native of Eastern Temperate Himalaya, Khasia Hills and Upper Burma.

Castanea sativa, Mill, Brandis Ind. Trees 635. The Sweet or Spanish Chestnut. A medium-sized deciduous tree. *Leaves* 5-10 in. long by 2-4 in. broad, elliptic or elliptic-lanceolate, acuminate, cuspidate-serrate, green and glabrous above, pale and more or less pubescent beneath; *petiole* .3-1 in. long. *Spikes* erect, axillary, the lower male, the upper androgynous, the female at the base. *Flowers* strongly scented. *Male flowers* 3 or more in the axil of each bract; *stamens* numerous. *Female flowers* usually 3 in. an involucre; ovary 6-celled; styles 6. *Fruit* 1.5-3 in. diam., densely spinous, splitting into 2-4 valves. *Seeds* 1-3.

Indigenous to South Europe, but cultivated in Dehra Dun. The seeds are roasted or cooked in milk and eaten. Fl. March. Fr. July-Aug.

LXXXII. SALICACEÆ.

Deciduous trees or shrubs, generally fast-grown and soft-wooded. *Leaves* alternate, simple, stipulate; buds enclosed in scales. *Flowers* diœcious, both male and female in terminal catkins, each in the axil of a bract; bracteoles and perianth none. *Stamens* 2 or more, generally free, on a variously-shaped glandular disk. *Ovary* sessile or stipitate, 1-celled; style short or 0; ovules erect, anatropous, generally on 2-4 parietal or basal placentas. *Fruit* a 2-4-valved loculicidal capsule; seeds few or many, exalbuminous, each with a tuft of long silky hairs.

The plants of this Family can be easily propagated by cuttings, and being also fast-growing, might be useful in quickly filling up blanks.

Analysis of the Genera.

- Leaves short-petiolate ; stamens generally 2 ; fr. 2-valved 1. *SALIX*.
 Leaves long-petiolate ; stamens 4 or more ; fr. 2-4-valved 2. *POPULUS*.

1. *Salix*, Linn.*The Willows.*

Trees or shrubs. *Leaves* ovate to narrow-lanceolate, short-petioled ; stipules deciduous, larger and more persistent on luxuriant young shoots. *Catkins* usually on leaf-bearing peduncles. *Bracts* entire. *Disk* of 1-2 glands. *Stamens* generally 2, long-exserted ; filaments usually free. *Stigma* 2-fid or lobed, rarely entire. *Capsule* conical or narrow-lanceolate, 2-valved, with placentas near the base of the valves.

Analysis of the Species.

- Stamens 3-12 ; flowers after the leaves.**
 Leaves broadly lanceolate ; male catkins 2-4 in. long 1. *S. tetrasperma*.
 Leaves linear-lanceolate ; male catkins 1-2 in. long 2. *S. acmophylla*.
Stamens 2 ; capsules pubescent.
 Filaments connate throughout, or at least half their length 6. *S. oxycarpa*.
 Filaments free 4. *S. Wallichiana*.
Stamens 2 ; capsules glabrous.
 Leaves 1-2 in. long ; filaments very villous at the base 3. *S. elegans*.
 Leaves 2-5 in. long ; filaments usually glabrous at the base 5. *S. daphnoides*.

1. *S. tetrasperma*, Roxb. ; Fl. Br. Ind. v. 626. Brandis For. Flora 462, Ind. Trees 636 ; Gamble Man. Ind. Timb. 685. Vern. *Bed*, *Jalmálá*, *Dún* ; *Lailá*, *Bhairish*, Hind.

A moderate-sized tree; branchlets often tomentose; bark greyish-brown blackish, rough with deep vertical furrows. *Leaves* 3-6 in. long, oblong or ovate-lanceolate, finely serrulate, rarely entire, glabrescent, glaucous beneath; lateral nerves numerous, prominent; petiole .3-1 in. long; stipules ovate or orbicular. *Flowers* after the leaves, on leaf-bearing peduncles. *Male catkins* 2-4 in.; *female* 3-5 in. long. *Stamens* 5-10, free; anthers minute. *Stigmas* 2, subsessile, entire. *Capsules* .1-1.5 in. long, ovoid, on slender stipes of nearly the same length, in groups of 3-4, glabrous or puberulous; seeds 4-6.

Common on river-banks and moist or water-logged places in the Dún, i.e., Lachiwala, Nakraunda, Karwapani, etc.

Heartwood red, soft, porous; annual rings not very distinct; weight about 33 lbs. per c. ft. It is used for gunpowder charcoal, and for posts and planks in Assam. The leaves are lopped for cattle-fodder, and the twigs are made into baskets.

New leaves Feb., Mar. Fl. generally Feb.-Mar., less frequently Oct.-Nov. Fr. two months after flowering.

2. ***S. acmophylla***, Boiss.; Fl. Br. Ind. v. 628; Brandis For. Flora 463, Ind. Trees 636; Gamble Man. Ind. Timb. 686. Vern. *Bed, Bádú, Jalmála, Dún.*

A small handsome tree, bark rough with irregular, mainly vertical cracks; twigs slightly hairy when young. *Leaves* 2-8 by .3-.7 in., those near the catkins much smaller, linear-lanceolate, upper caudate-acuminate, typically quite entire, sometimes serrulate, glabrate or with adpressed hairs, when young, glabrous and glaucous beneath when mature; lateral nerves faint; petiole .1-.4 in. *Flowers* after the leaves on leafy peduncles. *Male catkins* 1-2 in.; *female* 1 in. long, both nodding. *Bracts* long, hairy. *Stamens* 4-6, usually 6; anthers short, globose; filaments free, woolly towards the base. *Stigmas* 2, sessile, entire, spreading. *Capsule* shortly stipitate, ovoid-oblong, glabrous, about .2 in. long.

Saharanpur-Siwaliks and Dehra Dun, along streams; Shahjahanpur Rau; Mohand Pass; Mohan Rau; Phandowala; Dudhli; Mussoorie; etc.

This according to Mr. Parker is almost certainly the tree described as *S. dealbata*, Anders., the type of which came from Mohan Rau between Saharanpur and the foot of the hills. Subsequently it was reduced to *S. acmophylla*, Boiss. by Anderson, but it is possible that it is distinct (*vide* Parker's Forest Flora for the Punjab (1924), p. 505).

Wood apparently of no great value. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. May, June.

3. ***S. elegans***, Wall.; Fl. Br. Ind. 630; Brandis For. Flora 466, Ind. Trees 637; Gamble Man. Ind. Timb. 688. Vern. *Chhoti Bishroi*, Jaunsar; *Kadvi*, Garhwal.

A middle-sized shrub; branches dark-green, drying black; young parts often grey-pubescent. *Leaves* 1-2 in. long by .4-.9 in. broad, elliptic, obovate or oblong, obtuse or rounded, rarely acute at the tip, serrulate or subentire, hairy along the midrib, otherwise glabrous above, glaucous beneath, subcoriaceous when mature; lateral nerves indistinct; petiole .1-.2 in. long. *Flowers* after the leaves on leaf-bearing peduncles, catkins often androgynous. *Male catkins* 1-2 in.; *fem.* 1.5-4 in. long. *Bracts* yellow, ciliate. *Stamens* 2; anthers elliptic; filaments very villous in the lower half, free or united by the hairs. *Stigmas* 2, subsessile, 2-partite. Fruiting catkins 1.5-5 in. long. *Capsule* conical, under .15 in. in length, shortly stipitate.

An extremely common gregarious shrub in Jaunsar and Tehri-Garhwal, 7 10,000 ft. generally associated with brambles and roses.

Wood pinkish; annual rings distinct; weight 33 lbs. per c. ft. chiefly used as fuel. The leaves are used as fodder for cattle and goats.

Fl. Mar., Apr. Fr. May, June.

The leaves of this and *S. daphnoides* are often attacked by a brilliant orange-coloured fungus, which is *Lecythea salicina*. Lev.

4. ***S. Wallichiana***, Anders.; Fl. Br. Ind. v. 628; Brandis For. Flora 468, Ind. Trees 637; Gamble Man. Ind. Timb. 687. Vern. *Bhainshra*, Jaunsar.

A small tree; young parts silky; bark greenish-grey. *Leaves* 2-4 in. long by .6-1.2 in. broad, sometimes larger, oblong or ovate-lanceolate, acuminate, entire or obscurely glandular-serrate, silvery-tomentose on both surfaces when young, nearly glabrous when mature and glaucous beneath or persistently silky on both surfaces; lateral nerves numerous, not very distinct; *petioles* .2-.35 in. long. *Flowers* before or sometimes with the leaves; peduncles very short, generally with 1-3 rudimentary leaves at the base. *Male catkins* erect, 1-1.5 in. long; *female* 2-3 in. long, ascending, flexuous; rachis tomentose. *Bracts* dark brown, densely silky. *Stamens*

2; filaments free; anthers elliptic-oblong. *Stigmas* 2, erect, subsessile. *Capsule* downy, slender, short-stipitate, or sessile. .25 in. long.

JAUN SAR and TEHRI-GARHWAL, ascending to 9,000 ft., but common between 7,000 and 8,000 ft., i.e., Konain, Kathian; etc.

Wood white or pinkish-white; weight 32 lbs. per c. ft. The branches are made into baskets, and the twigs are used as tooth-brushes.

Fl. Mar. Apr.

5. *S. daphnoides*, Villars.; Fl. Br. Ind. v. 631; Brandis For. Flora 469, Ind. Trees 637; Gamble Man. Ind. Timb. 689. Vern. *Bāshroi*, *Bhainshrā*, Jaunsar.

A large shrub or small tree; branches dark-green or brown, shining or with a glaucous bloom, pubescent when young; bark smooth, greenish-grey. *Leaves* 2-5 in. long by .7-2 in. broad, elliptic-lanceolate (narrower in higher elevations), acuminate, serrate, glabrous above except the midrib, glaucous beneath; glateral nerves numerous, prominent, silky beneath; *petiole* .2-.6 in., pubescent or downy; *stipules* ovate lanceolate. *Flowers* before the leaves; peduncle very short, with or without a few rudimentary leaves. *Male catkins* 1-2 in., erect; *female* 2-4 in., nodding or pendulous, both densely silky. *Bracts* linear-lanceolate, villous. *Stamens* 2; anthers oblong, yellow; filaments glabrous; *style* filiform; *stigmas* diverging, entire. *Fruiting catkins* 4-7 in. long. *Capsule* subsessile, glabrous, .2-.25 in. long.

JAUN SAR and TEHRI-GARHWAL, 7,000 to 10,000 ft. Fairly common about Deoban, Konain and Kathian, Deota, etc.

Heartwood red, shining, annual rings distinct; weight about 34 lbs. per c. ft. In the arid tracts of the Himalaya the wood is used for building, and for pails, tubs and similar purposes. The twigs are made into baskets, and are used for wattle-and-daub walls. The leaves and twigs, and even the bark of branches, are used for cattle-fodder.

Fl. Mar., Apr. Fr. May, June.

6. *S. oxycarpa*, Anders.; Fl. Br. Ind. v. 636, Brandis Ind. Trees 638.

A large deciduous shrub or small tree; young shoots slightly pubescent when young, glabrous and shining when mature, dark-brown; bark rough greyish. *Leaves* 1.5-4 in. long by .5-1.5 in. broad, elliptic-oblong, acute or acuminate, serrulate or subentire, glabrous above except on the midrib, pale glaucous and slightly pubescent beneath especially on the midrib; *petiole* .1-.3 in. long;

stipules minute. *Flowers* appearing with the leaves. *Male catkins* 1-2 in. long, dense, subsessile, with a few small leaves at the base; *female catkins* on short leafy shoots 1-5-2 in. long; *bracts* dark-brown, silky. *Stamens* 2; *filaments* glabrous, connate throughout or only to half their length; *stigmas* erect, bifid. *Fruiting catkins* 2-3-5 in. long; *capsule* .25 in. long, silky-pubescent, stipitate.

JAUNSAAR and TEHRI GARHWAL 6-8,000 ft. e.g., Mundali; Khadra; etc.

S. flabellaris, Anders, *S. Lindleyana*, Wall., and *S. furcata*, Anders.; Fl. Br. Ind. v. 634, may be mentioned as examples of dwarf willows, similar in habit to *Cotoneaster microphylla*, Wall. *Leaves* and *catkins* up to 1 in. in length. *Capsules* ovoid, red, glabrous. Such willows are characteristic of the high arctic or alpine climates and are found about the heads of the Ganges, Jumná and Tons rivers, 11,-15,000 ft., e.g., Harki Dún.

S. babylonica, Linn.; Fl. Br. Ind. v. 629. Brandis Ind. Trees. Vern. *Majnun*. The weeping willow. A medium-sized tree with long slender pendulous branchlets. *Leaves* 3-7 in. long by .4-.75 in. broad, linear-lanceolate, serrulate, acuminate, pubescent when young, glabrous or slightly pubescent beneath when mature; *petiole* .2-.4 in. long. *Flowers* with the leaves. *Male* and *female catkins* .5-1 in. long, on short leafy puduncles; *bracts* small, pale-coloured. *Stamens* 2, *filaments* free, villous at the base. *Capsule* sessile, glabrous; *stigmas* sessile, spreading.

Cultivated as an ornamental plant in gardens and cemeteries throughout India.

Fl. Feby.-March.

2. *Populus*, Linn.

1. *P. ciliata*, Wall.; Fl. Br. Ind. v. 638; Brandis For. Flora. 475, Ind. Trees 640; Gamble Man. Ind. Timb. 690. The Himalayan Poplar. Vern. *Piplás* (corruption of Poplar), *Biāon*, *Sharphārā*, *Tilaunju*, *Kapási*, Jaunsar; *Pahāri Pipal*, Hind.

A lofty tree; bark grey, smooth on young plants, with vertical wrinkles or fissures on old stems; buds viscid, lanceolate. *Leaves* 3-7 by 2-5-5 in., broad-ovate, acuminate, finely dentate, margins gland-ciliate, otherwise quite glabrous; base usually cordate, 3-5-nerved; lateral nerves 4-6 pairs above the basal, irregularly forked; *petiole* 2-5 in. long, compressed above. *Flowers* before the leaves in lateral catkins. *Male catkins* 2-4 in. long, somewhat interrupted; *female* 6-9 in. long, lax in fruit. *Disk* toothed, embracing half the ovary. *Bracts* .3 in. long, early caducous. *Stamens* indefinite; *filaments*

short, very slender. *Stigmas* 3-4, obcordate, subsessile. *Capsule* 3-5 in. long, ovoid, 3-4-valved; stipes and hairs of the seeds as long as the capsules.

JAUNSAH and TEHRI-GARHWAL, 4-10,000 ft.; sometimes cultivated. Affects sunny blanks with a light soil. Male trees are very scarce.

Wood white or brownish-grey, shining, soft; annual rings distinct. Medullary rays fine, very numerous. Weight about 30 lbs. per c. ft. The wood is used for water-toughs, and the leaves are valued as fodder for goats.

Leafless Oct.-Feb. Fl. Mar., Apr.; the males much earlier than the females. Fr. May, June.

MONOCOTYLEDONS.

Sub-class i.—*Petaloidæ*.

LXXXIII. SCITAMINEÆ.

HERBS, generally with a perennial rhizome and an unbranched stem, often aromatic. *Leaves* pinnately parallel-nerved from a stout midrib. *Flowers* irregular, usually 2-sexual, solitary or in spikes or panicles. *Calyx* superior, free, tubular or spathaceous. *Corolla* gamopetalous; limb 3-partite. *Stamens* usually only 1 fertile, the rest reduced to petaloid staminodes, rarely (in *Musa*) 5 fertile. *Ovary* 3-celled; ovules many, generally axile; style slender. *Fruit* a 3-valved capsule, sometimes indehiscent. *Seeds* often with an arillus.

This Family has great economic importance, but is not of much forest interest within the range of this Flora. The following are cultivated in these parts and are well-known throughout India:—

1. *Curcuma longa*, Linn.; Fl. Br. Ind. vi. 214. The Turmeric plant. Vern. *Haldi*, Hind.—Remarkable for its bright-yellow tubers which are used as a condiment throughout India. *Leaves* 1.1-5 ft. by 4-8 in.; petiole as long as the blade. Peduncle about 3 in. long. *Flowers* yellowish. It is much cultivated near Kálsi and Saia.

2. *Zingiber officinale*, Rosc.; Fl. Br. Ind. vi. 246. The Ginger plant. Vern. *Adra*¹, Hind.—Well-known for its aromatic rootstock which is used as a condiment and also in medicine. *Leaves* distichous, 6-12 by 1.1-5 in., dark-green. Much cultivated in the Dún and also above Kálsi.

3. *Zingiber roseum*, Rosc.; Fl. Br. Ind. vi. 244;—A weed about 3 ft. high common in sal forests and in shady ravines in the Dún. It has red bracts and pale yellowish red flowers in short dense spikes which are produced directly from the rootstock.

4. *Musa sapientum*, Linn. ; Fl. Br. Ind. vi. 262. The Banana or Plantain tree. Vern. *Kelā*, Hind.—This differs from the rest of the Family by having five perfect stamens, and unisexual flowers arranged in a drooping spike. *Leaves* 4-8 ft. long, glabrous above, usually with a white bloom beneath. Two or three varieties are cultivated in the DŪN and OUTER HIMALAYA and also in the SAHARANPUR DISTRICT. A wild variety is found in ravines of the Nāgsidh Hill and in the Khairi swamp in the DŪN, Sahansra-dhārā and similar other ravines in the OUTER HIMALAYA, and in the Amlāwa valley in JAUNSR.

5. *Costus speciosus*, Smith ; Fl. Br. Ind. vi. 249 ;—is a common weed in Sāl forests in the DŪN, characterised by large white flowers in dense terminal ovoid or oblong spikes, pink bracts and bright-red capsules.

6. *Hedychium coronarium*, Kœn. ; Fl. Br. Ind. vi. 225.—A tall herb with erect leafy stems 4-6 ft. high and a fleshy rootstock 1-2 in. thick. Flowers pure white, fragrant, in dense oblong terminal spikes 4-8 in. long is found in certain localities in the Dūn as Mothronwala, etc., and is often cultivated in gardens. Fl. Sept.-Dec.

LXXXIV. DIOSCOREACEÆ.

Large climbing herbs with a fleshy tuberous underground rootstock ; stems annual. *Leaves* alternate or opposite, simple or digitately 3-7-foliate, basal nerves prominent, curving upwards, venation reticulate. *Flowers* small, regular, 1-sexual, spicate or racemose, dioecious or monoecious in separate spikes. *Male flowers* ; *perianth* campanulate, rotate, or urceolate, 6-cleft ; lobes short, spreading ; *stamens* 6, all perfect, or 3 perfect, with or without staminodes ; *anthers* small, the cells contiguous or discrete on branches of the filaments ; *pistillode* thick, fleshy or 0. *Female flowers* ; *perianth-segments* 6, free, smaller than in the male, *staminodes* 6, 3 or 0 ; *ovary* inferior, 3-quetrous, 3-celled ; *ovules* 2 in each cell superposed, pendulous ; *styles* 3,

very short; *stigmas* terminal, entire or 2-fid, recurved. *Fruit* a berry or a 3-valved capsule.

There are no woody plants in this Family but the following species of *Dioscorea* deserve mention on account of their being very common.

Dioscorea, Linn.

Herbs with slender twining stems often bearing bulbils in the axils of leaves, root-tuber solitary, usually large, especially in cultivated species. *Leaves* alternate or opposite, entire or lobed or digitately 3-7-foliate; basal nerves 5-9, prominent. *Flowers* small, bracteate, 1-sexual, usually diœcious. *Male* flowers: *Perianth* 6-cleft; segments short, spreading, in 2 series; stamens 6, all perfect or sometimes only 3 bearing anthers; pistillode thick and fleshy or none. *Female* flowers: *Perianth*-segments 6, small, free, persistent; *Staminodes* 6, 3 or 0; *ovary* inferior, 3-quetrous, 3-celled; *ovules* 2 in each cell, pendulous, *stigmas* reflexed. *Fruit* a 3-winged, loculicidal capsule. *Seeds* compressed, often winged.

Analysis of the Species.

Leaves digitately compound.

Perfect stamens 3, alternating with 3 staminodes; leaves 3-5-foliate

Leaflets large (up to 6 in. long)

sparsely pubescent 1. *D. pentaphylla*.

Leaflets small (up to 4 in. long)

narrower, glabrous 2. *D. melanophyma*.

Perfect stamens 6, leaves 3-foliate 3. *D. triphylla*.

Leaves simple.

Stem twining to the right 4. *D. belophylla*.

Stem twining to the left.

Male spikes solitary, often branched; seeds winged all round 5. *D. deltoidea*.

Male spikes clustered, unbranched; seeds winged on one side 6. *D. bulbifera*.

1. *D. pentaphylla*, Linn.; Fl. Br. Ind. vi. 289. Prain et Burkill in Jour. and Proc. Asiat. Soc. Bengal, New Series X (1914) 23.

Root-tubers oblong; stems slender pubescent, twining to the left, prickly towards the base. *Leaves* alternate, 3-5-foliate, sparsely pubescent; *common petiole* 1-2.5 in. long; *leaflets* 3-6 in. long by 1-2 in. broad, elliptic-lanceolate, oblanceolate or obovate, acuminate or cuspidate, base usually acute, lateral leaflets broader and oblique at the base; *petiolules* .05-.15 in. long. *Male spikes* .5-1.5 in. long, arranged in large panicles; *flowers* pale greenish, fragrant. Perfect stamens 3 with 3 staminodes. *Female spikes* 2-10 in. long, axillary, solitary or 2-3 together, pubescent. *Capsule* .7-1 in. long by about .5 in. broad, slightly pubescent. Seeds winged at the top.

Common in Dehra Dun and the Siwalik range, e.g., Asarori; Dehra Dun, etc.

Fl. Sept. Fr. March.

2. **D. melanophyma**, Prain et Burkill; Jour. and Proc. Asiat. Soc. Beng., New Series iv (1908) 452.

Tubers obovoid-rotund, densely covered with roots; stems glabrous, slender, twining to the left. *Leaves* alternate, usually 3-5 foliate, glabrous; *common petiole* 1-3.5 in. long; *leaflets* 1.5-4 in. long by .4-.9 in. broad, narrowly lanceolate, with a finely acuminate tip; *petiolule* 0-2 in. long. *Male spikes* pubescent, 1-2 in. long, axillary, solitary or 2 together. Perfect stamens 2 with 3 staminodes. *Female spikes* pubescent, solitary, axillary, about 1.5 in. long. *Capsule* .6 in. long by .25 in. broad, more or less truncate at the apex, rounded at the base. Seeds winged at the top.

Mussoorie, 6-7,000 ft.

Fl. Sept.

3. **D. triphylla**, Linn. var. *dæmona*, Roxb.; Prain et Burkill in Jour. and Proc. Asiat. Soc. Bengal, New Series X (1914) 26; Syn.—*D. dæmona*, Roxb.; Fl. Br. Ind. vi. 289 excl. var.

Stems usually pubescent, more or less prickly, twining to the left. *Leaves* alternate, 3-foliate; *common petiole* 3-7 in. long, usually prickly; *leaflets* 3-7 in. long by 2-5 in. broad, broadly cuneate-obovate, cuspidately caudate-acuminate, membranous, pubescent when young, glabrous when mature, base 3-5 nerved; lateral leaflets very oblique; *petiolule* .12-.5 in. long. *Male spikes* dense, pedunculate, .2-3 in. long, arranged in clusters along axillary slender pubescent racemes up to 18 in. long; *stamens* 6, all antheriferous. *Female spikes* up to 12 in. long; *flowers* solitary, distant. *Capsule* 1.5-2 in. long by 1 in. broad, truncately rounded at the ends, smooth and polished. Seeds winged at the top.

Dehra Dun and the Siwalik hills, in ravines.

Fl. July. Fr. Oct.-Nov.

4. **D. belophylla**, Voigt; Prain et Burkill in Jour. and Proc. Asiat. Soc. Beng., New Series X (1914) 36; Syn.—*D. glabra*; Fl. Br. Ind. vi. 294 (in part). Vern. *Turar*, *Turhur*.

Stems glabrous, twining to the right. *Leaves* usually opposite, rarely alternate, simple, 3-6 in. long by 1.5-4 in. broad, variable, usually ovate-oblong, acuminate, deeply cordate or sagittate at the base, glabrous and green above, glaucous beneath, base usually 9-nerved with conspicuous close sub-parallel cross nervules between the veins beneath; *petiole* 1.5 in. long. *Male spike* 1-1.5 in. long, 1-3 together in the leaf axils or sometimes forming leafless panicles; *stamens* 6, all anther bearing. *Female spikes* 2-5 in. long, usually solitary, axillary. *Capsule* 1 in. long by about as broad or a little broader, obovate with a retuse apex or orbiculate.

Common in the Dún and the Siwaliks chiefly in stony ground, ascending to 5,000 ft. in TEHRI-GARHWAL, e.g., Kalsi; Thano; Asarori; Tons valley; below Mussoorie; etc.

Fl. Sept.-Oct.

The Tubers are highly prized for culinary purposes and are sold in the Bazar in Dehra under the name of Turar.

5. **D. deltoidea**, Wall.; Fl. Br. Ind. vi. 291; Prain et Burkill in Jour. and Proc. Asiat. Soc. Bengal X (1914) 16.

Stems glabrous twining to the left. *Leaves* usually alternate lower sometimes subopposite, simple, 2-6 in. long by 1.5-4.5 in. broad, ovate, or subdeltoid-ovate, acuminate, membranous, often cordate, the basal lobes rounded, or sometimes dilated outwards, 7-9-nerved at the base, glabrous above, with a few minute hairs on the nerves beneath; *petiole* about as long as the blade, slender. *Male spikes* solitary, axillary, simple or sometimes branched, slender, lax, 3-15 in. long; *flowers* in small distant clusters; *stamens* 6, all anther-bearing. *Female spikes* solitary, slender, up to 6 in. long; *flowers* few, distant. *Capsule* .75-1 in. long, winged all round often unequally so.

JAUNSAAR and TEHRI-GARHWAL, ascending to 9,000 ft. (rarely up to 10,000-11,000 ft.) e.g. Mundali; Datmir, Bajamara, Mussoorie; etc.

Fl. May-July.

6. **D. bulbifera**, Linn.; Prain et Burkill in Jour. and Proc. Asiat. Soc. Bengal X (1914) 26; Syn.—*D. sativa*, Hook f.; Fl. Br. Ind. vi. 295.

Stems glabrous, twining to the left, bearing numerous brown, warted bulbils about 1 in. or so in diameter. *Leaves* usually alter-

nate, simple, 2.5-6 in. long by 1.75-4 in. broad, sometimes larger, ovate, membranous, finely caudate-acuminate, more or less deeply cordate at the base, basal lobes rounded, base usually 9-nerved. *Male spikes* slender, drooping, 2-4 in. long, clustered in the leaf axils or sometimes panicle; *stamens* 6, all anther-bearing. *Female spikes* simple, fascicled in the leaf axils, 4-10 in. long. *Capsule* .7-.9 in. long by .6 in. broad, oblong. *Seeds* winged at the base.

Common in the Dun and Saharanpur Districts, ascending to 5,000 ft. in the hills, *e.g.*, Dehra Dun; Ladhpur; Lachiwala; near Mussoorie; Rajpore; etc.

Fl. July-Sept.

LXXXV. LILIACEÆ.

Herbs or small shrubs with creeping root-stocks, bulbs or corms. *Flowers* usually 2-sexual. *Perianth* coloured, often herbaceous; segments 6 or more in two series, usually imbricate in bud. *Stamens* 6, free or connate; anthers often versatile. *Ovary* 3-celled; ovules 1-2, axillary, style 1, often long. *Fruit* a 3-celled capsule, or a 1-or more-seeded berry; seeds globose or flattened.

This large Family is well known for flowers of great beauty, some of them exquisitely fragrant. Of useful cultivated plants, the Onion, *Allium Cepa*, Linn., Vern. *Piáz*, Hind., and the Garlic, *Allium sativum*, Linn., Vern. *Lahsín*, Hind., Fl. Br. Ind. vi. 337,—deserve mention. Of forest Genera only the following two are described.

Analysis of the Genera.

- | | |
|---|---------------|
| Leaves normal, 3-5-nerved; fls. 1-sexual,
umbelled | 1. SMILAX. |
| Leaves represented by cladodes; fls. 2-
sexual, solitary, fascicled or racemed . | 2. ASPARAGUS. |

1. *Smilax*, Linn.

Generally climbing shrubs. *Leaves* usually alternate, 3-5-nerved, net-veined; petiole often with tendrils near the base. *Flowers* dioecious, umbelled. *Perianth-segments* 6, free. **MALE FLS.**: *Stamens* 6, free, sometimes forked at the tip separating the anther-cells. **FEM. FLS.**: *Staminodes* 3 or 6. *Style* 0 or very short; stigmas 3. *Fruit* a globose berry; seeds 1-3, generally 2; albumen horny.

Analysis of the Species.

Unarmed.

- Stems erect; petioles ecirrhose . . . 1. *S. vaginata*.
 Stems climbing; petioles cirrhose . . . 2. *S. parvifolia*.

Armed; stems climbing; petioles cirrhose.

- Umbels sessile, arranged on axillary
 and terminal rachises, forming a
 racemose inflorescence . . . 3. *S. aspera*.

Umbels pedunculate.

Sheaths of petioles auricled.

- Umbels 1-3 . . . 4. *S. Roxburghiana*.
 Umbels 7-20 . . . 5. *S. prolifera*.

Sheaths of petioles not auricled.

- Umbels usually 1, rarely 2; pedicels .2-.5 in. long . . . 6. *S. indica*.
 Umbels usually 2-3, rarely 1; pedicels .15-.25 in. long . . . 7. *S. macrophylla*.

1. *S. vaginata*, Decne.; Fl. Br. Ind. vi. 305.

A gregarious undershrub about 2 ft. high, with round, smooth, unarmed branches. *Leaves* 1-3 in. long by 1-2.5 in. broad, elliptic-ovate or nearly orbicular, obtuse or acute, entire, membranous, base rounded or subcordate, strongly 3-nerved with a pair of additional weak nerves, reticulation prominent, glaucous on the under-surface; *petiole* .3-.6 in., slender, sheathing for one-fourth to one-half its length, ecirrhose. *Umbels* axillary, solitary, stalked, males several-flowered, females 1-flowered; *peduncle* and *pedicels* very slender; *bracteoles* none. *Flowers* minute, purplish. *Sepals* and *petals* minute. *Stamens* much shorter than the perianth; *staminodes* in female flowers 6. *Berry* .3 in. diameter.

JAUNSAK and TEHRI-GARHWAL up to 9,000 ft. *e.g.*, Konain ; Lokandi ; Deoban ; etc.

Fl. April-May.

2. *S. parvifolia*, Wall.; Fl. Br. Ind. vi. 304.

A climbing shrub with stiff slender zigzag branches, unarmed. *Leaves* very variable, 1-3·5 in. long by ·5-2 in. broad, ovate or ovate-lanceolate, acute or acuminate, entire, prominently reticulate, often glaucous beneath, base rounded or subcordate, 3-5 nerved ; *petiole* ·1-·3 in. long, sheathing half way up or more ; *sheath* usually cirrhose. *Umbels* axillary, solitary, stalked, few-flowered ; *peduncle* very slender, up to 1 in. long ; *pedicels* up to ·5 in. long, filiform. *Flowers* minute, purple ; *bracteoles* numerous, minute. *Sepals* and *petals* minute. *Stamens* much shorter than the perianth, filaments very short, anthers didymous ; *staminodes* in female flowers 1-3. *Berry* ·25 in. diameter, blue-black.

Common in MUSSOORIE, JAUNSAK and TEHRI-GARHWAL, up to 8,500 ft. *e.g.*, Kurog ; Kathian ; Mundali ; Deota ; etc.

Fl. April-May.

3. *S. aspera*, Linn.; Fl. Br. Ind. vi. 306 ; Brandis Ind. Trees 641.

A large climbing shrub, branches grooved, zigzag, armed or not. *Leaves* 2-5 in. long by 1-3 in. broad, ovate, deltoid or lanceolate, acute or acuminate, margin entire or sometimes with prickly teeth, base rounded, truncate, or cordate, usually 7-nerved, prickly or not on the mid-rib beneath ; *petiole* ·5-1 in. long, often prickly, narrowly margined near the base for one-fifth of its length, the sheath ending in 2 long slender cirrhi. *Umbels* numerous, sessile, in axillary and terminal spikes 1-6 in. long. *Peduncle*, 0 ; *pedicels* ·1-·15 in. ; *bracteoles* minute. *Flowers* white, sweet-scented. *Male sepals* ·15 in. long, *female* rather smaller ; *anthers* linear, shorter than the filaments ; *staminodes* in female flowers 6. *Berry* ·2-·3 in. diameter, red at first, finally becoming blue-black when ripe.

OUTER HIMALAYA and low valleys in JAUNSAK, *e.g.* DEHRA DÚN ; Arnigadh ; Mussoorie ; etc.

Fl. Sept.-Nov.

4. *S. Roxburghiana*, Wall.; Fl. Br. Ind. vi. 311.

A large climber ; branches smooth, terete, more or less prickly ; branchlets 4-angled. *Leaves* 5-10 in. long by 3-7 in. broad, elliptic, ovate or ovate-lanceolate, rounded, subcordate or cuneate at the base, coriaceous, acuminate, basal nerves usually 5, springing

from a little above the base; *petiole* variable with large, thickly coriaceous, 2-auricled sheaths below the middle; *auricles* in old leaves up to 2 in. long, produced behind into rounded lobes embracing the branch, cirrhose. *Umbels* many-flowered, 1-3 on a common peduncle; *peduncle* 1-3 in. long, bracteate at the base; *pedicels* .3-.5 in. long, slender. *Flower-buds* .2 in. long. *Sepals* and *Petals* linear-oblong, glabrous. *Stamens* as long as the sepals; *staminodes* in female flowers 3. *Stigmas* long, recurved. *Berry* .3 in diameter, globose. *Seeds* 1 or 2.

Dehra Dun, in ravines; Mussoorie.

Fl. March-July.

5. ***S. prolifera***, Roxb.; Fl. Br. Ind. vi. 312; Brandis Ind. Trees 641; Gamble Man. Ind. Timb. 724. Vern. *Ramdatuun*, U. P.

A stout climbing shrub with prickly stem. *Leaves* very variable in size and form, 4-8 by 2-6 in., oblong, ovate or orbicular, coriaceous; nerves 3-7 from above the rounded or sub-cordate base; *petiole* .5-1.5 in. long, often auricled at the base round the stem; tendrils 2-4 in. long. *Umbels* 7-20, 30-40-flowered; peduncles .7-1.5 in.; pedicels .5 in. *Sepals* .1 in., oblong-lanceolate. *Petals* as long, but narrower. *Stamens* 6, .1 in. long; staminodes of fem. fls. 3. *Ovary* oblong; stigmas deciduous. *Berries* round, red when ripe, .3 in. diam.

Economic uses as of the other species.

Common in the DEHRA AND SAHARANPUR DIVISIONS, especially in S&I forests. Also in the OUTER HIMALAYAS.

Fl. Aug., Sept. Fr. Dec.-Feb.

6. ***S. indica***, Vitm.; Syn.—*S. Villandia*, Wall.: Fl. Br. Ind. vi. 314.

A large deciduous climber with stems about 1 in. diameter, armed with recurved prickles. *Leaves* variable in size, 4-10 in. long by 1.75-7.5 in. broad, elliptic or elliptic-ovate, entire, shining, acute or shortly acuminate, base rounded, usually 5-nerved, the inner lateral pair united with the midrib for a short distance above the base, reticulation thin, prominent; *petiole* .4-1 in. long, narrowly sheathing at the base, cirrhose. *Umbels* axillary, usually solitary, rarely 2 on a common peduncle, 20-45-flowered; *common peduncle* .3-.5 in. long; *pedicels* .2-.5 in. long, slender, lengthening in fruit. *Flowers* greenish, fragrant; *flower-buds* .2-.3 in. long, oblong; *bracteoles* small, numerous. *Sepals* and *petals* recurved. *Stamens* 6, about as long as the petals; *staminodes* in female flowers 3; *stigmas* 3, nearly sessile. *Berry* .35-.45 in. diameter, globose, red when ripe.

Dehra Dun in ravines, e.g., Bindal nala; Robber's cave; Lachiwala; etc.

Fl. July-Aug.

7. **S. macrophylla**, Roxb.; Fl. Br. Ind. v. 310; Brandis. Ind. Trees 641. Vern. *Ram-dataun*, U. P.

A large prickly climber, stem sometimes exceeding 1 in. in diam.; branches striate. *Leaves* ovate or orbicular, 6-18 in. long, thinly coriaceous, cuspidate, shining above; nerves 5-7 from the rounded, subcordate or suddenly acute base; petiole stout .5-1.5 in. long, the lower half narrowly sheathing. *Umbels* 2-3, rarely, many-flowered; male peduncle slender, .5-1.5 in. long, pedicels .15-.25 in. long, stout in fruit. *Sepals* 2 in. long, linear. *Stamens* as long as the sepals. *Stigmas* 3, sessile. *Berries* round, .3-.5 in. diam.

Fairly common in the Sál forests of the DUN and SAHARANPUR DIVISIONS.

The stem has a strong fibre which can be used for brushes. The thinner stems are used as tooth-sticks.

Fl. rainy season. Fr. cold weather.

2. *Asparagus*, Linn.

Erect or straggling shrubs; rootstock generally terminating in a dense fascicle of spindle-shaped farinaceous roots. *Leaves* reduced to scales or spines, with tufts of green needle-like or flattened rudimentary branchlets (cladodes) in the axils, which are likely to be mistaken for the true leaves. *Flowers* axillary, solitary fascicled or racemed. *Perianth* 6-partite; stamens, opposite the perianth-segments; style 1; stigmas 3. *Fruit* a globose berry.

Analysis of the Species.

Stem unarmed. Fls. not racemed; cladodes

flat.

Stem spinous. Flowers racemed.

Cladodes .5 in. or more long.

Cladodes 2-6 together, spines usu-

ally recurved

Cladodes 6-20 together, spines

straight

Cladodes not more than .25 in. long

1. *A. filicinus*.

2. *A. racemosus*.

3. *A. adscendens*.

4. *A. Currillus*.

1. **A. filicinus**, Ham.; Fl. Br. Ind. vi. 314; Brandis Ind. Trees 642. Vern. *Sharánoi*, *Kauntá*, Jaunsar.

An erect unarmed shrub. *Cladodes* .3-.5 in. long, flat, falcate, acuminate. *Flowers* scarcely .1 in. diam., solitary or in pairs, white; pedicels .0-.7 in., jointed above the middle, very slender. *Berries* .2-.3 in. diam.

Common in JAUN SAR, up to 9,000 ft., e.g., at Deoban.

The tuberous roots are pickled and are used in medicine. The shoots are eaten as a vegetable.

Fl. May, June.

2. **A. racemosus**, Willd.; Fl. Br. Ind. vi. 316; Brandis Ind. Trees 642; Gamble Man. Ind. Timb. 724. Vern. *Satráwal* Dún, *Sharánoi*, Jaunsar; *Satmulí*, Hind.

A much-branched scandent shrub with terete stem and triquetrous branchlets; spines .2-.5 in., more or less recurved; *Cladodes* 2-6 together, .6-1 in. long, narrowly subulate, falcate and divaricate, channelled beneath. *Racemes* 1-2 in. long; pedicels .15 in. long, jointed in the middle, slender below the joint. *Flowers* white, .1-.15 in. diam. *Anthers* purplish. *Berries* .15-.25 in. diam.

Throughout the DÚN and the PRÁINS, ascending to 5,000 ft. in JAUN SAR, e.g., Binálgádh, Dhárágádh, etc.

The tuberous roots of this as well as of the following species have the same use as those of *A. filicinus*.

Fl. Oct., Nov. Fr. Cold season.

3. **A. adscendens**, Roxb.; Fl. Br. Ind. vi. 317. Vern. *Jhirna*, Garhwal; *Hazar-muli*, Hind.

A suberect shrub with stout terete stem and grooved ascending branchlets; spines .5-.7 in., stout, straight. *Cladodes* 6-20 together, terete and very slender. *Racemes* 1-2 in. long, many-flowered; pedicels .1-.2 in., jointed. *Flowers* white, .1-.15 in. diam. *Berries* .2-.3 in. diam., 1-seeded.

Common in the DÚN, especially in Sál forests, e.g., Phán-dowála.

Fl. Autumn. Fr. Cold season.

4. **A. Currillus**, Buch-Ham; Fl. Br. Ind. VI. 318.

A much-branched sub-scandent undershrub; branchlets grooved, minutely scaberulous; spines slender, slightly curved, .25-.7 in. long. *Cladodes* .12-.25 in. long, 3-6 together, spreading or ascending, linear, flattened or subtriquetrous, acute. *Flowers*

in short, few-flowered racemes; *bracts* minute; *pedicles* .1-.12 in. long, jointed below the middle, slender. *Perianth* .12 in. long; segments spreading. *Berries* .25 in. diameter, red when ripe.

DEHRA DUN and TEHRI-GARHWAL up to 5,000 ft. in the hills e.g., Thano; Laluri.

Fl. Feby.-Oct.

Gloriosa superba, Linn.; Fl. Br. Ind. vi. 358. Vern. *Kalhari*. A tall glabrous scrambling herb 5-10 ft. high with sessile or subsessile, oblong-lanceolate, acuminate leaves, tip linear, spirally twisted to form a tendril. *Flowers* solitary in the leaf-axils on 3-6 in. long pedicels, nodding; *Perianth* 3-4 in. across, persistent; segments 6, spreading at first, reflexed afterwards, margins crisply undulate, yellow with a blotch of bright red in the upper portion. *Stamens* 6, filaments golden-yellow. *Capsule* oblong, 1.5-2 in. long.—Common in Dehra Dun among bushes in the outskirts of forests. The roots are considered a violent poison in Hindu Materia Medica and are used in medicine.

Fl. Rainy season.

Urginea indica, Kunth; Fl. Br. Ind. vi. 347; Vern. *Kānda Sáhāranpur*;—is a small herbaceous plant with long linear leaves, and an erect racemose scape bearing greenish-white flowers. It has a large bitter bulb, which is used by the weavers about Jawálápur to brush and size their fabrics. Found in the SAHÁRANPUR SIWALIS and also in the TONS VALLEY, e.g., Sendrá, Morágádh, etc.

Lilium giganteum, Wall.; Fl. Br. Ind. vi. 349; Vern. *Giotra*, Jaunsar, is the largest of all lilies. *Stem* 6-12 ft. long, tapering, hollow. *Leaves* 12-18 in. long, broadly ovate-cordate. *Flowers* 5-7 in. diam., drooping, fragrant; buds linear-oblong, 3-4 in. long. *Anthems* .5 in. long, versatile, yellow. *Capsule* 3 in., septa feathered. Fairly common in damp ravines in JAUN SAR, 6,-9,000 ft.;—Deoban, Mundáli, etc. Jaunsari boys make trumpets of the hollow stems, which give a deep bass note. Fl. July, Aug.

Subclass ii.—*Spadicifloræ*.

LXXXVI. PALMÆ.

Shrubs or trees with usually an unbranched cylindrical stem, erect or scandent, filled inside with cellular

tissue which is traversed by strands of closed fibrovascular bundles. *Leaves* alternate, pinnatisect or palmatis-lobed, with numerous nerves parallel to the segments; petiole broad-based, amplexicaul or sheathing. *Inflorescence* a simple or paniced spike, enclosed in one or more spathes. *Flowers* 1-2-sexual or polygamous, usually 3-bracteate. *Perianth* inferior; segments 6, in two series, generally persistent, often accrescent in fruit. *Stamens* usually 6; anthers versatile, sometimes introise. *Ovary* 1-3-celled, or of three distinct 1-celled carpels; stigmas 3, usually sessile. *Fruit* a drupe or berry. *Seeds* with copious albumen which is ruminant or uniform, solid or hollow.

This most important tropical Family is represented within the limits of this Flora by only two Genera.

Analysis of the Genera.

Erect shrubs. Sheaths not armed; fruit naked	1 PHENIX.
Scandent shrubs. Sheaths armed; fruit covered with imbricating adpressed scales	2. CALAMUS.

1. *Phoenix*, Linn.

Low or tall palms. *Leaves* pinnate; leaflets sessile, linear, entire, rigid, folded, obliquely attached to the rachis, the lowest transformed into strong spines; petiole inarticulate, persistent, with a fibrous amplexicaul sheath. *Flowers* dioecious, sessile; male in compact, female in interrupted, compound spikes; peduncle axillary, compressed. MALE FLS.: *Calyx* cup-sh ped, 3-toothed. *Petals* 3, valvate. *Stamens* usually 6. FEMALE FLS.: *Calyx* as of the male, accrescent in fruit.

Petals 3, imbricate; staminodes 6. *Carpels* 3, free; stigmas sessile. *Fruit* an oblong 1-seeded drupe. *Seed* ventrally grooved; embryo dorsal; albumen even.

Analysis of the Species.

Stem bulbiform. Fruiting peduncle very short	1. <i>P. acaulis</i> .
Stem at length elongate. Fruiting peduncle long	2. <i>P. humilis</i> .

1. ***P. acaulis***, Buch.; Fl. Br. Ind. vi. 426; Brandis For. Flora 555, Ind. Trees 645; Gamble Man. Ind. Timb. 731. Vern. *Khajūr*, *Khajūri*, Hind.

Stem like a bulb, never free above the ground. *Leaves* 2-5 ft. long; rachis laterally compressed; leaflets 9-18 in. long, .5-7 in. broad, very strongly nerved, thick, folded at first, opening out when mature; base raised on the side of the rachis and decurrent with it. *Spadix* 6-10 in. long, compressed; branches stout; peduncle of fruiting spadix flat, 6-8 in. long, but generally concealed in the sheaths of the petioles. *Fruit* seated on the spikelets at a narrow vertical angle, .5-.7 in. long, ovoid-oblong, with a pinkish tip when young, blackish when ripe.

Common in the DÚN and SAHÁRANPUR FORESTS, generally in grass-lands, e.g., Bám Block, Pathri Forest; Doiwála, Jhabráwála, Johrá Block, Bidhálna Block, etc.

The leaves are plaited into a coarse matting, and make excellent brooms for use on fire-traces. The fruit is eaten.

Fl. Dec., Jan. Fr. Apr., May.

2. ***P. humilis***, Royle; Fl. Br. Ind. vi. 426; Brandis Ind. Trees 645; Gamble Man. Ind. Timb. 731. Vern. *Khajūr*, Hind.

A low palm with a slender stem 6-8 ft. high. *Leaves* 3-8 ft. long; rachis laterally compressed; leaflets 12-18 in. long, thin, smooth, faintly nerved, always folded, generally scattered, sometimes in opposite pairs; base only slightly raised on the side of the rachis, or not at all raised. *Male spadix* 1 ft. long; *female* somewhat shorter (excluding the peduncle); spikes often paniculately subdivided; peduncles flat, of fruiting spadix 2-2.5 ft. long, .5-.8 in. broad. *Fruit* almost horizontal, .5-.7 in. long, ovoid, generally mucronate, red when ripe.

SAHĀRANPUR SIWALIKS, especially towards the crest, but common and of considerable size near Rānipur. It also occurs in the Chir forests of TEHRI-GARHWAL, *e.g.*, in the Lúnágádh and Khúnigádh Blocks.

Economic uses as of *P. acaulis*.

Fl. Dec., Jan. Fr. Apr.-June.

P. sylvestris, Roxb. ; Fl. Br. Ind. vi. 425 ; Brandis For. Flora 554 ; Gamble Man. Ind. Timb. 419—The Wild Date Palm—Vern. *Khajúr*,—is cultivated in the DŪN, and also in the SAHĀRANPUR DISTRICT. It is often 30-40 ft. high, with a crown 12-15 ft. in diam. *Fruiting peduncle* 2-2.5 ft. by 1-1.5 in. with a large bunch of spikes. *Fruit* 1-1.2 in. long, yellow while ripening, reddish-brown when fully ripe. *Seeds* furrowed to the centre. In Bengal and in most parts of Madras sugary sap is extracted from the tree by cuts made near the head. The leaves are made into mats, and the fruit is eaten. Fl. April-May. Fr. Sept.-Oct.

2. *Calamus*, Linn.

1. *C. tenuis*, Roxb. ; Fl. Br. Ind. vi. 447 ; Brandis Ind. Trees 652 ; Gamble Man. Ind. Timb. 735. Vern. *Bet, Bent*, Hind.

A climbing palm, growing in clumps from underground rhizomes ; the upper part covered with sheaths of leaves. *Leaves* pinnate, 1.5-2.5 ft. long. *Leaflets* many, equidistant, gradually smaller towards the top, 4-12 by .3-.5 in., linear-lanceolate, acuminate, 3-nerved, the nerves and margins with bristles or prickles ; petiole with straight spines ; rachis with one row of short recurved conical prickles ; sheath with adpressed flat spines and with a whip-like long thong armed with recurved prickles. *Spadices* axillary, decompound, of various sizes according to position ; spathes tubular, lower 6-10 in. long, armed with recurved prickles, upper scurfy. *Flowers* small, in pairs, male in scorpioid spikelets, female pedicellate and somewhat accrescent in fruit, both on the same spike. *Cayle* campanulate, 3-toothed. *Petals* 6, valvate. *Stamens* 6. *Ovary* 3-celled. *Fruit* .5 in. long, elliptic, clothed with closely-imbricating adpressed reflexed scales with dark-brown margins. *Seeds* ovoid-oblong, .4 in. long.

Marshy places in the DŪN, *e.g.*, Gángbhewá, Mothronwála, Gularghátí, Nakraunda, Jogiwála, Khairi, etc.

The cane is locally used for various purposes, chiefly for chairs and morahs. It is, however, inferior in quality to the cane used for the same purposes in Bengal, Assam and Burma, as it becomes brittle very soon, and is not so strong or durable. The

leaves are eaten by buffaloes, and the seeds are strung up in rosaries worn by faqirs.

Fl. July, Aug. Fr. Cold season.

LXXXVII. TYPHACEÆ.

Perennial aquatic herbs. *Leaves* linear, sessile, thick, spongy. *Flowers* monœcious, very small, densely crowded in cylindrical or globose spikes, male above the female flowers. *Perianth* 0, or reduced to green scales or hairs. *Stamens* 1 or more. *Ovary* superior, 1-2-celled; styles persistent; stigmas laterally papillose. *Fruit* minute.

A small unimportant Family, of which only one species is briefly noticed :—

1. *Typha elephantina*, Roxb.; Fl. Br. Ind. vi. 489, Vern. *Paterá*, Saháranpur.—A tall gregarious marsh plant 8-12 ft. high. *Leaves* radical, bayonet-shaped, 4-6 ft. long, by .7-1.25 in. broad triquetrous above the sheath; margins often undulate above the middle. *Female spike* 6-10 in. long by .3-1 in. diameter, brownish-orange. *Male spike* 2-3 in. above the female on the same rachis, 8-12 in. long, pale-coloured. The leaves are made into mats, and are also used for temporary walls. The pollen is said to be made into cakes and eaten. Found in the Pathri Block in the SAHÁRANPUR DISTRICT, where it is rather an important article of minor forest produce. It is also found in swamps in the DŪN.

LXXXVIII. ARACEÆ.

Perennial herbs, sometimes scandent. *Leaves* alternate, generally net-veined and sheathing at the base. *Flowers* usually 1-sexual and monœcious, the male above the female, sessile, in fleshy spikes which are more or less enclosed in a green or coloured spathe, and often tailed. *Perianth* 0, or of minute scales. *Anthers* 2-4.

celled. *Ovary* sessile, 1-3-celled; stigma discoid or lobed. *Fruit* a berry, free or confluent.

Of this herbaceous Family only the following forest plants appear deserving of mention:—

Analysis of the Genera.

Ovary 1-celled; ovule solitary, basilar . . . 1. *Scindapsus*.
Ovary 2-celled; ovules many . . . 2. *Rhaphidophora*.

1. *Scindapsus*, Schott.

S. officinalis, Schott.; Fl. Br. Ind. vi. 541. Vern. *Poria-bel*, Dún.

A stout succulent climbing shrub rooting freely from the stem which attains 1 in. or more in diameter and is marked with annular scars of fallen leaves. *Leaves* 5-10 in. long by 3-6 in. broad, ovate or elliptic-ovate, entire, caudate-acuminate, base obliquely rounded or subcordate, primary nerves distinct; *petiole* 3-6 in. long, sheathing at the base, broadly winged to a little below the apex. *Peduncle* terminal, solitary, 1.5-2 in. long. *Spathe* oblong, 4-6 in. long, green outside, yellow within, long-pointed, deciduous. *Spadix* stout, about as long as the spathe, elongating in fruit. *Ovary* 1-celled; *ovule* 1, basal; *stigma* elongate, hemispheric in fruit. *Berries* fleshy; *seed* ovate-cordate, exalbuminous.

DEHRA DÚN in moist situations, e.g., Lachiwala; Nala-pani; etc.

Fl. Rainy season.

2. *Rhaphidophora*, Schott.

R. glauca, Schott.; Fl. Br. Ind. vi. 547.

A tall climber; stem about 1 in. thick, succulent. *Leaves* 6-12 in. long by 5-9 in. broad, elliptic-ovate, acuminate, subcoriaceous, green above, glaucous beneath, segments usually 3-5, unequal, falcate, linear or broader, caudate-acuminate. *petiole* 6-10 in. long slender, channelled on the upper surface up to the base of the blade. *Peduncle* axillary, solitary, 3-6 in. long. *Spathe* variable in size, fleshy, ovate-oblong or lanceolate-oblong, cuspidate, longer than the spadix, pale-yellow on both surfaces. *Spadix* sessile, cylindric, obtuse, pale-yellow, 2-4 in. long; *ovary* 2-celled; *ovules* many; *stigma* of fresh ovary a short slit, of the dried, raised.

Shady damp localities in the hills, e.g., above Rajpore; Mussoorie; etc.

Fl. February.

Acorus Calamus, Linn.; Fl. Br. Ind. vi. 555. Vern. *Bach*, Hind. The Sweet Flag. A marsh herb much resembling *Jypha* in habit. *Leaves* ensiform, 2-4-ft. by .5-1 in., with wavy margins. *Spathes* 6 to 18 in. long; *spadix* 2-3 in. long, .5-.7 in. in diam., sessile, cylindrical, dense-flowered, flowering upwards. *Flowers* 2-sexual. *Sepals* 6, orbicular. *Stamens* 6; filaments flat. *Ovary* conical, 2-3-celled; ovules many, pendulous. *Fruit* a few-seeded berry. The strongly aromatic fibrous rootstock which has a piquant pungent taste, is much valued as a medicine, specially for cough.

Many plants of this Family are cultivated, chiefly for their starchy corms, of which *Colocasia Antiquorum*, Schott: Fl. Br. Ind. vi. 523; Vern. *Ghuiyán*, is well known throughout the UNITED PROVINCES, and is extensively cultivated in the PLAINS and up to 6,000 ft. in the HILLS, as an important food-plant.

Sub-class iii.—*Glumifloræ*.

LXXXIX. CYPERACEÆ.

The Sedges.

Grass-like herbs; stems solid, generally triquetrous. *Leaves* tristichous; sheaths not split. *Flowers* minute solitary, subtended by a single glume, in spikes which are variously arranged. *Perianth* 0, or reduced to bristles or scales. *Stamens* 1-3; *anthers* innate. *Ovary* 1-celled; *style* 2-3-cleft, branches stigmatose. *Fruit* a compressed or 3-gonous nut. *Embryo* central.

Numerous plants of the Family are found in the region of this Flora, some of which are useful as fodder or for other purposes, but they are beyond the scope of this book. One, however, deserves mention, being noted for its strong fibre:—

Eriophorum comosum, Wall.; Fl. Br. Ind. vi. 664.—*Stem*, 6-20 in., slender, tough. *Leaves* serrulate, harsh, overtopping the stems. *Umbels* 2-8 in. diam. *Bracts* 8-12 in. *Glumes* dark-brown;

glossy. *Nuts* 3-gonous, beaked, smooth. Common in the SIWALIKS and the HIMALAYAS, and put to much the same uses as the *Bhābar* grass, *Ischaemum angustifolium*, Hack.

XC. GRAMINEÆ.

The Grasses.

Herbs, shrubs or trees; stem jointed; internodes generally hollow. *Leaves* alternate, simple, entire, closely parallel-nerved; base sheathing, distinct from the blade; sheath almost always split in front to the base, often with a ligule at the apex, sometimes constricted into a petiole and jointed to the blade. *Flowers* usually 2-sexual, in variously arranged spikelets. *Spikelets* with 1-3 empty glumes at the base. *Flowering glumes* distichous, each with a 2-nerved scale at its axil which is called the *palea*. Between the *palea* and the flowering glume is the true flower consisting of 2 or 3 minute ciliate scales (*lodicules*), and stamens or a pistil, or both. *Stamens* usually 3, rarely 6 or more, hypogynous; *anthers* versatile. *Ovary* 1-celled; *styles* 2 or 3, clothed with stigmatose hairs. *Fruit* a 1-seeded **caryopsis**; embryo erect or oblique, at the base of the grain, with copious mealy albumen.

This large Family is divided into several Tribes of which the most important from a forest point of view is the following :—

TRIBE I. BAMBUSEÆ.

The Bamboos.

This Tribe is distinguished from other Tribes chiefly by comprising all shrubby and tree-like grasses, commonly known as Bamboos,—by the blade of the leaf

being petiolate and articulated to the sheath which is variously auricled,—and by being protected, while young, by a second form of sheath which usually produces no true leaf. The flowers, moreover, have generally 6 or more stamens, while those of other grasses have only 3, and the flowering takes place usually at intervals of many years whereas the others flower and generally die every year.

Analysis of the Genera.

Stamens 3: pericarp adnate to the seed.

Small bamboos 1. ARUNDINARIA.

Stamens 6. Generally large bamboos.

Pericarp adnate to the seed 2. BAMBUSA.

Pericarp separable from the seed 3. DENDROCALAMUS.

1. *Arundinaria*, Michx.

Small bamboos. *Culms* slender, rarely over 1 in. in diameter, hollow; branches short and fascicled at the nodes. *Culm-sheaths* papery; blade narrow, subulate. *Leaves* usually small, often with transverse veinlets. *Inflorescence* paniculate or racemose. *Spikelets* 1-many-flowered, usually 2-sexual. *Empty glumes* 2, unequal, membranous. *Flowering glumes* longer, many-nerved. *Palea* 2-keeled. *Lodicules* 3, ciliate. *Stamens* usually 3. *Ovary* globose above; stigmas 2-3, plumose. *Grain* dorsally furrowed, included in the persistent flowering glume and palea.

Analysis of the Species.

Rootstock cæspitose; culms crowded.

Leaves without transverse veinlets 1. *A. falcata*.

Leaves with conspicuous transverse veinlets 2. *A. spathiflora*.

Rootstock long-creeping; culms distant 2. *A. jaunsarensis*.

1. *A. falcata*, Nees; Gamble Bamb. Brit. Ind. 12, t. 11; Man. Ind. Timb. 744, No. 12; Fl. Br. Ind. vii. 381; Brandis For. Flora 562, Ind. Trees 665; Vern. *Go-Ningál*, Jaunsar; *Ringál*, Hind.

A small bamboo. *Culm* 6-10 ft. high, .3-.6 in. diam., cylindrical, sometimes with a white bloom; nodes much swollen; internodes 6-12 in. long. *Culm-sheaths* scaberulous without, tapering to a truncate tip, 12 by 3 in.; margins ciliate; blade subulate, recurved; ligule toothed. *Leaves* 3-4 by .2-.5 in., with pellucid glands in rows between the nerves; sheath glabrous. *Flowers* in panicles, on separate leafless stems. *Spikelets* .5-.7 in., distant or 3-4 together.

Common between 4,000 and 7,500 ft. in JAUN SAR and TEHRI-GARHWAL; more or less gregarious; Korwá, Chakrata; Mautárgádh, etc. It flowered in Mussoorie and in Jaunsar in 1878 and again in 1916.

2. *A. spathiflora*, Trin.; Gamble Bamb. Brit. Ind. 17, t. 16, Man. Ind. Timb. 745. No. 16; Fl. Br. Ind. vii. 382; Brandis Ind. Trees 665; Syn.—*Thamnocalamus spathiflorus*, Munro; Brandis For. Flora 563. Vern. *Deo-Ningál*, Jaunsar; *Ringál*, Hind.

Culm 12-20 ft. high, .5-1 in. diam., smooth, glaucous-green when young; nodes prominent; internodes 6-15 in. long. *Culm-sheaths* loose, glabrous; margins ciliate; blade 2-4 in. long, subulate, erect; ligule fimbriate. *Leaves* 3-5 by .4-.6 in., linear-lanceolate; margins scabrous; petiole .1-.2 in.; main nerves joined by numerous transverse veins; sheath 2-3 in. long, truncate; auricles bristly; ligule long-ciliate. *Flowers* in paniculate racemes. *Spikelets* 1-2.5 in. long, pedicelled, 2-3 together in a narrow spathe-like yellow sheath—whence the specific name.

Common in JAUN SAR and TEHRI-GARHWAL, 7,500-9,000 ft., generally above the zone of *A. falcata*; eminently gregarious in habit. It flowered gregariously in JAUN SAR in 1882 and again in 1892.

3. *A. jaunsarensis*, Gamble Bamb. Brit. Ind. 23, t. 22, Man. Ind. Timb. 745. No. 23; Fl. Br. Ind. vii. 384; Brandis Ind. Trees 665. Vern. *Ningál* or *Rinál*, Jaunsar.

This handsome little bamboo is easily recognised from *A. spathiflora* upon whose zone it encroaches, by its single culms, arising from a long creeping jointed rhizome. *Culm* 10-15 ft. long, .5 in. diam., nodes marked by a narrow ring, internodes 9-11 in. long. *Culm-sheath* yellow, glabrous, narrowed to a truncate 2-auricled bristly tip. *Leaves* 4-6 in. long, lanceolate, acuminate, with numerous transverse veins between the nerves. *Flowers* and *sikelets* not seen yet.

Tutuagadh, Mundali, Jaunsar 7-8,000 ft. This has not yet been collected in flower.

A. Falconeri, Benth. & Hook. f.; Fl. Br. Ind. vii. 383,—is also found in TEHRI-GARHWAL. It closely resembles *A. spectabilis*, but the leaves have no transverse veins, and the spathe like sheaths are much smaller. It flowered in EASTERN TEHRI-GARHWAL in 1885 and again in 1906, thus indicating a flowering cycle of 21 years.

These small bamboos are used for fishing rods, hooka-pipes, and locally for baskets and similar other purposes. They flower at intervals of 20-30 years.

2: *Bambusa*, Schreb.

Large bamboos, usually growing in clumps. *Culm-sheaths* broad; blade often triangular. *Leaves* linear or oblong-lanceolate, acuminate, shortly petioled. *Inflorescence* usually a large leafless panicle bearing heads of spikelets. *Spikelets* 1-many-flowered. *Empty glumes* 1-4. *Flowering glumes* ovate, lanceolate, mucronate. *Palea* 2-keeled. *Lodicules* 3, membranous, ciliate. *Stamens* 6. *Ovary* oblong or obovate; stigmas 2-3. *Grain* furrowed on one side; pericarp thin, adherent.

Analysis of the Species.

- | | |
|--|----------------------------|
| Culms distant, unarmed; nodes not much raised; leaves and spikelets long | 1. <i>B. nutans</i> . |
| Culms crowded, armed; nodes prominently raised; leaves and spikelets short | 2. <i>B. arundinacea</i> . |

1. *B. nutans*, Wall.; Gamble Bamb. Brit. Ind. 32, t. 30; Man. Ind. Timb. 746; Fl. Br. Ind. vii. 387; Brandis For. Flora 567, Ind. Trees 668. Vern. *Bāns*, Hind., which is the common name for all large bamboos.

Culms rising from a creeping rhizome, not crowded, 20-40 ft. high, 1.5-3 in. diam., straight, gracefully nodding; nodes not much raised, often hairy; internodes 15-18 in. long, thick-walled, not shining. *Culm-sheaths* 6-9 in. long, top rounded, with adpressed

black hairs on the back; blade varying in size according to position in the culm, acute, margins recurved, black-hairy within, with 2 large wavy densely-bristly auricles; ligule narrow, dentate. *Leaves* 6-12 by 1-1.5 in., scabrid at tip and along the midrib and margins; nerves 7-10; tip twisted; base rounded or narrowed; petiole .1-.2 in.; sheath striate, produced into a falcate auricle which is crowned with long bristles. *Inflorescence* a stiff panicle of spike-like branches which bear interrupted clusters of spikelets. *Spikelets* .7-1 in. long, glabrous, acute, many empty or with buds inside; axis (*rachillum*) clavate. *Lodicules* 3, fimbriate. *Anthers* apiculate. *Stigmas* 2-3, twisted. *Grain* oblong, hairy on the top.

Cultivated in the DÚN, also in low valleys in JAUNSA, about villages and in sacred groves; also in gardens for ornament; Barkôt, Káluwála; Amláwa Valley, etc.

Straight, thick-walled and never crowded, it is a very useful bamboo for use as rafters, and as shafts of dog-carts and *ekkas*.

Flowers periodically at long intervals.

2. **B. arundinacea**, Willd.; Gamble Bamb. Brit. Ind. 51. t. 48, Man. Ind. Timb. 748; Fl. Br. Ind. vii. 395; Brandis For. Flora 564, Ind. Trees 671; Vern. *Kántá Báns*, Hind.

A tall thorny bamboo with crowded culms rising from branching rootstocks. *Culms* bright-green, shining, varying in size, the largest 80-100 ft. high, 6-7 in. diam.; nodes prominent, lower with almost leafless spinescent more or less zigzag horizontal branches; internodes up to 18 in. long, somewhat depressed near the base of the branches, thick-walled; cavity small. *Culm sheaths* 12-15 by 9-12 in., together with the blade triangular when flattened out, thickly covered with golden hairs when young; blade 2-4 in. long, triangular, acuminate, glabrous without, matted with dark bristles within; margins wavy, involute, thickly ciliate, auriculate; ligule narrow. *Leaves* 8 by 1 in., often much smaller, linear or linear-lanceolate, glabrous above, glabrate beneath; margins scabrous; tip sharp, stiff; main nerves 4-6, with pellucid glands at intervals; base rounded, often somewhat oblique, ciliate near the petiole; petiole .1 in., often swollen; sheath with short auricles, thickly ciliate when young. *Inflorescence* an enormous panicle, often comprising the whole culm. *Spikelets* about 5 in a cluster, .5-.7 in. long, lanceolate, acute, bearing a few male flowers above the 2-sexual ones. *Lodicules* 3, small, fimbriate. *Stamens* slender, drooping; anthers obtuse. *Grain* ending in a short beak formed by the base of the style.

Cultivated in the DEHRA DÚN and SAHÁRANPUR DISTRICTS: Ajabpur, Mothronwála, etc.

Its great strength and superior size make it eminently fit for all building purposes, but owing to the thorns and the crowded condition of the clumps, it is extremely difficult to pull the bamboos out except in small pieces.

Appears to flower gregariously at intervals of 30-32 years. It flowered gregariously in Dehra Dun in 1925.

3. *Dendrocalamus*, Nees.

Unarmed bamboos, often of very large size. *Culm-sheaths* usually elongate; blade narrowly triangular. *Leaves* short-petioled, often with pellucid glands. *Spikelets* few-flowered, in congested globose clusters, on the long branches of a compound panicle. *Flowers* usually 2-sexual. *Empty glumes* 2-3, ovate, acute or mucronate. *Flowering glume* like the empty glumes. *Palea* of lower flowers 2-keeled, ciliate, of the uppermost flowers rounded on the back and not ciliate. *Lodicules* usually none. *Stamens* 6. *Ovary* hairy above; style long; stigma simple. *Grain* small, surrounded by a crustaceous pericarp.

Analysis of the Species.

- | | |
|---|---------------------------|
| A middle-sized bamboo. Spikelets
spinescent, lanceolate, green, not
depressed | 1. <i>D. strictus</i> . |
| A large bamboo. Spikelets soft, ovoid,
purple, depressed | 2. <i>D. Hamiltonii</i> . |

1. *D. strictus*, Nees.; Gamble Bamb. Brit. Ind. 78, t. 68, 69, Man. Ind. Timb. 751; Fl. Br. Ind. vii, 404; Brandis For. Flora 569, Ind. Trees 675. The Male Bamboo. Vern. *Bāṅs*, Hind.

A densely-tufted gregarious bamboo, deciduous in dry climates or in years of drought. *Culms* variable in size according to climate from 20 to 50 ft. in height, and 1 to 3 in. in diam., dark-green, with a white waxy bloom when young, yellowish when old, characteristically crooked and twisted in congested clumps; nodes somewhat swollen, lower often rooting; internodes 10-15 in. long, solid or with a small cavity. *Culm-sheaths* variable in size, 3-12

in. long, paraboloidal, glabrous or with yellowish-brown hairs on the back; top rounded, ciliate, slightly auricled; blade triangular, hairy, especially within; ligule narrow. *Leaves* very variable in size, between 10 by 1·2 in. and 1 by ·2 in., generally about 6 in. long, linear-lanceolate, rough and more or less hairy on both surfaces, scabrous on the edges; midrib prominent, lateral nerves 3-6 pairs; base abruptly rounded; tip twisted; petiole 1·2 in.; sheath hairy at first, terminating in a prominent callus; auricle short, ciliate; ligule narrow, serrate. *Panicle* large; clusters of spikelets 1-1·5 in. diam., 1-2 in. apart. *Spikelets* 3·5 in. long, 1·2 in. diam., usually **hairy outside**, with 2-3 fertile and many sterile flowers; glumes all spinescent. *Palea* emarginate. *Stamens* long-exserted; filaments fine; anthers 2·3 in. long. *Grain* ovoid, beaked, hairy above.

Indigenous and gregarious in the SIWALIKS, especially towards Hardwar; cultivated in the DŪN.

In North-West India this is the only bamboo that is found wild in any quantity and is therefore used for a variety of purposes. It is strong and durable and, but for its small size, would easily be the best bamboo in India. It supplies many industries, e.g., basket-making at Hardwar, and the manufacture of furniture at Bareilly.

A few clumps in a forest, or a few culms in a clump here and there, flower every year; but at the interval of a certain number of years it flowers gregariously over large areas. One such gregarious seeding took place towards Ránipur in 1884.

Fl. Nov.-Apr. Fr. June.

2. D. Hamiltonii, Nees & Arn.; Gamble Bamb. Brit. Ind; 84, t. 74, Man. Ind. Timb. 752; Fl. Br. Ind. vii. 405; Brandis For. Flora 570, Ind. Trees 676. Vern. *Kāghzi-Bāṅs*, Hind.

An ugly-looking bamboo with stems slanting on all sides or curved downwards. *Culms* up to 80 ft. in height and 4·7 in. diam., with long stout branches above, adpressedly densely white-pubescent when young, dull-green when old; nodes marked with root-scars; internodes 12-20 in. long; walls 5 in. thick. *Stem-sheaths* glabrous or with patches of adpressed hairs; auricles acute; blade lanceolate, with incurved margins; ligule 2 in., smooth, entire. *Leaves* variable up to 15 by 2·5 in., broadly lanceolate, cuspidate, smooth above, rough beneath, minutely serrulate at the edges; main lateral nerves 6-17 pairs, secondary nerves with pellucid glands between, base often unequal-sided, rounded; petiole short; sheath glabrous within, with **adpressed white hairs** without, slightly keeled below the callus; ligule broad. *Panicle* very large, branches furrowed on one side; clusters of spikelets 5-1·5 in. diameter, 5-1 in. apart, supported by scarious bracts. *Spikelets* 4 in. long, ovoid, depressed, purple.

glabrous ; glumes membranous ; flowers 2-4, all fertile. *Stamens* exserted, pendulous ; anthers purple, with a hairy tip. *Grain* broadly ovoid, beaked.

Cultivated in the DÚN, and about villages in the MUSSOORIE and JAUNSAIR HILLS. It seems to thrive well.

Being thin-walled and rather soft, it is not very good for building purposes, but is much used for basket and mat-work. The young shoots are eaten as a vegetable. The Gáros cook rice in the hollow internodes which they place over fire in a slanting position and keep turning at short intervals until the outside is all charred ; then they split the bamboo open to take out the rice.

It flowers both annually and gregariously like *D. strictus*.

Besides the cultivated cereal crops which supply the staple food of man throughout the world, there are hundreds of grasses of great forest interest, some yielding fibre and paperstock, others supplying forest industries, others again useful as soil-binders, while a great many are indispensable for fodder. But they are obviously beyond the scope of this little Flora. Only a few forest grasses are mentioned below :—

1. *Coix Lachryma-Jobi*, Linn. ; Fl. Br. Ind. vii. 100. Job's Tear. Vern. *Sankru*, Hindi. Remarkable from the fact that the female spikelets are enclosed in a bract which, when the grain ripens, becomes like a polished hardened nut, open only by a small aperture at the apex. *Stem* 3-5 ft. *Leaves* 6-18 by 1-2 in. with wavy margins and cordate base ; sheaths smooth ; ligule short, glabrous, occurring as a rule near water. *Grain* about 3 in. long, ovoid, bluish-grey, hard, smooth and shining. Fairly common in grass-lands in the DÚN and the HILLS. Often cultivated for the sake of the grains which are used for food or for brewery purposes. The leaves and stems are good for cattle fodder and the latter is used in S. China as a material for matting.

2. *Thysanotæna agrostis*, Nees ; Fl. Br. Ind. vii. 61. Vern. *Pirlú*, Dún and Saháranpur. The Broom-grass. This is a tall grass up to 12 ft. high, with a dense bushy fox-tail-like terminal panicle. *Spikelets* very minute, sometimes viviparous. The large broad leaves somewhat resemble those of bamboos. It is often

used for brooms, and the stems furnish the reed-pens used in vernacular writing. Deep ravines and shady places up to 5,000 ft.

3. *Saccharum spontaneum*, Linn.; Fl. Br. Ind. vii. 118; Vern. *Kans*, *Kansi*, Hind.—A perennial and usually a gregarious grass 5-14 ft. high. Inflorescence usually reddish or purplish in colour when in flower, silvery white with long wide-spreading hairs in fruit; stem below the inflorescence silky with long white hairs. Used for thatching and as fodder for buffaloes. Common along river-banks and in waterlogged localities in the Dún and in Saháranpur District.

4. *Saccharum Munja*, Roxb.; *S. arundinaceum*; Fl. Br. Ind. vii. 199 (ex-parte); Vern. *Múnj*, *sarkara*, *sarkanda*. Hind.—A tall grass up to 20 ft. high, with a much-branched grey or greyish-brown silky panicle, and a glabrous stem. In the SAHÁRANPUR DISTRICT the stem which is used for chiks, morahs, etc., is called *bind*; the flowering scape, which is used for winnowing trays and for light covers over carts (*sirkí*), is called *tilú*; and the sheath next to the scape which is twisted into cordage and from which a neat durable matting is made, is called the *múnj* proper, after which the grass has been named. Common along ráus and the foot of the HILLS in the SAHÁRANPUR DISTRICT.

5. *Ischæmum angustifolium*, Hack.; Fl. Br. Ind. vii. 129; Vern. *Bhábar*, Saháranpur; *Báib*, *Bábai*, Hind.—Perhaps the most important of all forest grasses. Stems 3-5 ft. long, wiry, woolly at the base; leaves about 1 in. broad, convolute, very fibrous. Spikes simple or compound, 1-2 in. long, golden-or rusty-villous. Throughout the United Provinces the grass is made into ropes which are used for various purposes. It is also in great demand for paper-making at Lucknow and Calcutta. Common in the SAHÁRANPUR SIWALIKS.

5. *Cymbopogon Martini*, Stapf. Syn.—*Andropogon schænanthus*, var. *Martini*; Fl. Br. Ind. vii. 204; Vern. *Mírchá-gandh* Saháranpur.—A handsome grass 3-6 ft. high. Spikes inside a reddish-brown spathe. Base of leaf-blade rounded or cordate and amplexicaul. When the stems are cut away, the root-stocks get covered with curly posthumous leaves. It is the famous Rusa-grass from which an aromatic oil is extracted. The roots are used in medicine, and the rootstock is largely purchased by a certain class of pilgrims at Hardwar, probably as a souvenir for friends at home. Common in the plains portion of the Ránipur Range, SAHÁRANPUR DIVISION.

6. *Cymbopogon Nardus*, Linn. Syn.—*Andropogon Nardus* L. Fl. Br. Ind. vii. 205.—An aromatic grass much resembling *A. Schæ-*

nanthus, but the leaves are not rounded nor amplexicaul at the base, and the spathes much smaller. Also it has a somewhat different habitat; being found in the DŪN, and also in JAUNSAH up to 7,500 ft. as well as in the SAHARANPUR SIWALIKS.

7. *Anthistiria gigantea*, Cav.; Fl. Br. Ind. vii. 216; Vern. *Dhāla-ghās*, Dūn; *Kumria*, Garhwal.—A tall grass 8-16 ft. high, with a hard solid compound stem, notorious for its long-awned dark-brown hairy seed which readily get into clothes and are not easily got rid of. Common in the DEHRA and SAHARANPUR DIVISIONS, especially in coppice areas and blanks.

8. *Arundo Donax*, Linn.; Fl. Br. Ind. vii. 302. Vern. *Nal*, Hind.—A tall reed with hollow stems. *Leaves* tapering from an amplexicaul base. Axis of spikelets (*rachillum*) elongate, glabrous; flowering glume silky-hairy. *Panicle* thyrsiform. Found along streams and in shady ravines in the DEHRA and SAHARANPUR DIVISIONS.

9. *Phragmites communis*, Trin.; Fl. Br. Ind. vii. 303. Vern. *Nal*, Hind. This is a hollow reed found above 3,000 ft. in the HILLS, e.g., Thadiār and other places in GARHWAL. It is used for a kind of coarse matting.

10. *Phragmites Karka*, Trin.; Fl. Br. Ind. vii. 304. Vern. *Nal*, Hind. This reed is a native of the plains of India and is found at Pathri near Hardwar and such other water-logged localities. The stems are of a larger size but softer-walled than those of *P. communis*, and make a neater kind of matting.

The Genus *Phragmites* differs from *Arundo* by the leaves not being amplexicaul at the base, by short silky rachilla, and by glabrous flowering glumes.

GYMNOSPERMS.

XCI. GNETACEÆ.

TREES or shrubs with articulated branches. *Leaves* opposite, large or quite rudimentary, exstipulate. *Flowers* monœcious or diœcious, in axillary or terminal spikes or cones. MALE FLS. tubular or of 2-4 sepals; *anthers* 2-8, on a column of the connate filaments. FEMALE FLS. a naked erect ovule with several coats, one of which is produced into a style-like tube; *stigma* 0. *Fruit* dry or succulent, enclosed in the persistent bracts; seeds 1 or 2; cotyledons 2.

1. *Ephedra*, Linn.

1. *E. Gerardiana*, Wall. Brandis Ind. Trees 688, Syn.—*E. vulgaris*; Fl. Br. Ind. v. 640 (non Rich.); Brandis For. Flora 501, Gamble Man. Ind. Timb. 693. Vern. *Tút-ganthá*, Jaunsar.

A small shrub; branches opposite or whorled, green, striate; nodes 1-2 in. long; bark on old stems grey. *Leaves* scale-like; scales connate into a 2-lobed sheath, yellow or brown. *Spikes* 1-3 in. long, often in whorled clusters; fruiting spikes red, often succulent. *Fruit* 3 in. long, ovoid, red and sweet when ripe; seeds 2.

Dry southern exposures of the Deoban Ridge. JAUNSAR, 8,000 to 9,500 ft. e.g., Gidi Khad, below Karamba Peak, etc.

Wood yellowish-white, very close-grained, with inconspicuous pores. Goats browse on the branches, and the fruit is eaten in some places.

Fl. Apr.-June. Fr. Aug.-Oct.

XCII. CONIFERÆ.

Trees or shrubs with monopodial stems, generally evergreen; wood without pores on a cross section;

annual rings very distinct. *Leaves* alternate, or in alternate fascicles, rigid, generally acicular, exceptionally scale-like or linear, exstipulate. *Flowers* monœcious or diœcious; *perianth* none. MALE FLS. in deciduous catkins; *anthers* 1-or more-celled, adnate to the scales of the catkin, or on a column of connate filaments. FEMALE FLS. of 1, 2, or more naked ovules on a carpellary scale, which is free or adnate to the scales of a spike, the whole becoming a cone in fruit; *stigma* none. *Seeds* usually winged; cotyledons generally more than two.

Analysis of the Genera.

Ovules erect.

Female cone with only 1 flower; scales imbricate, basifixed; lvs. linear, not adpressed 3. TAXUS.

Female cone few-flowered, scales decussately opposite, peltate; leaves scale-like or subulate,

Scales woody, separating in mature fruit; seeds winged 1. CUPPRESSUS.

Scales succulent, connate in mature fruit: seeds not winged 2. JUNIPERUS.

Ovules pendulous.

(Female cone many-flowered, scales imbricate, basifixed; leaves, generally known as *needles*, not adpressed)
Leaves fascicled.

Leaves long (in the Indian species), in fascicles of 2-5; scales of cone persistent 4. PINUS.

Leaves short, in fascicles of many at least in buds; scales of cones deciduous 5. CEDRUS.

Leaves distant.

Leaves acicular, multifarious; cones pendulous, scales persistent 6. PICEA.

Leaves flat, bifarious; cones erect, scales deciduous 7. ABIES.

1. *Cupressus*, Linn.

1. *C. torulosa*, Don. ; Fl. Br. Ind. v. 645 ; Brandis For. Flora 533, Ind. Trees 693 ; Gamble Man. Ind. Timb. 696. The Himalayan Cypress. Vern. *Leuri*, *Leauri*, Jaunsar ; *Devidiar*, *Devidiār*. carpenters of Dún and Saháranpur.

A large evergreen tree with a pyramidal crown and drooping branchlets ; bark greyish-brown, peeling off in long thin strips. *Leaves* opposite, amplexicaul, scale-like, .05 in. long, triangular, more or less closely adpressed, with a gland on either side of the midrib. *Male catkins* terminal, cylindrical, with decussately opposite peltate scales, each with 2-6 anther-cells near the edge. *Female fl.* a globose cone consisting of 6-10 decussately-opposite peltate scales, the middle scales bearing 4-6 erect ovules at the base. *Mature cone* .5 in. diameter, bluish ; scales rugose, separating in drying into hexagons. *Seeds* compressed, with an orbicular wing, .2 in. diam., including the wing ; cotyledons 2-3.

JAUNSAR and TEHRI-GARHWAL, 6,900 ft., generally on limestone formations, often crowning rugged limestone precipices. Abundant on N.-E. aspects between the Lakánda and Moilá Peaks, JAUNSAR.

Heartwood light-brown with darker streaks, moderately hard ; medullary rays fine, numerous ; weight 39 lbs. per c. ft. It is used at Náini Tál for building, and is an excellent timber for sleepers, experiments carried out at the Forest Institute having proved it to be even more durable than Deodar. It is burnt as an incense in temples.

Fl. Jan., Feb. Fr. Oct., Nov., but remains long on the tree.

C. sempervirens, Linn. ; Vern. *Saru*, *Sarw* ; the Pyramidal Cypress—is an ornamental tree cultivated in gardens throughout India, which differs from *C. torulosa* by having a cylindrical crown and branches with erect tips, and a larger cone with tubercled scales.

C. funebris, Endl. : the weeping cypress—is a medium-sized elegant tree with bright-green hanging branches and lanceolate mucronate leaves with a spreading apex. Commonly cultivated in gardens and grave-yards throughout India.

2. *Juniperus*, Linn.

The Junipers.

Evergreen trees or shrubs. *Leaves* either all linear or pungent and whorled, or dimorphous, those on lower

branches or luxuriant shoots being subulate and pungent, and on upper branches scale-like and closely adpressed. *Flowers* monœcious or diœcious. **MALE** FLS. in small cylindrical or ovoid catkins; scales whorled, imbricate, each with 3-6 anther-cells. **FEM.** FLS. in small fleshy globose cones consisting of 3-6 connate carpellary scales, berry-like when mature. *Seeds* 1-5, with a thick hard testa, not winged; cotyledons 2-3.

Analysis of the Species.

- A shrub. Leaves linear, pungent; seed solitary 1. *J. squamata*.
 A small tree. Leaves dimorphous; seeds 2 or more 2. *J. macropoda*.

1. ***J. squamata***, Buch.-Ham. Syn.—*J. recurva*, Ham. var. *squamata*, Parla.; Fl. Br. Ind. v. 647; Brandis For. Flora 536, Ind. Trees 694; Gamble Man. Ind. Timb. 698. The Weeping Blue Juniper. Vern. *Gúgal*, U. P.

A bushy prostrate shrub. *Leaves* in whorls of 3, .15-.2 in. long, linear, pungent, somewhat narrowed at the base, flat and bluish-green above, convex and light-green beneath, often incurved. *Catkins* at the ends of short lateral branches; the *male* ovoid, yellow; the *female* small; ovules erect. *Fruit* an oblong berry, .3-.5 in. diam., with the tips of the scales protruding at the apex, the rest cohering into one mass, dark-purple, smooth, shining when ripe. *Seed* solitary, oblong, not winged.

TEHRI-GARHWAL, from 12,000 ft. upwards: Chánsil, Gangottari, etc. On the Chur mountain, SIMLA HILL STATES.

Sapwood white; heartwood light-red, very fragrant; weight 40 lbs. per c. ft. It is chiefly used for fuel and burnt as an incense. Fl. June, July. Fr. Aug.-Oct. of the second year.

2. ***J. macropoda***, Boiss.; Fl. Br. Ind. v. 647; Brandis Ind. Trees 694; Gamble Man. Ind. Timb. 698. Syn.—*J. excelsa*, M. Bieb.; Brandis For. Flora 538. The Himalayan Pencil Cedar. Vern. *Dháp*, U. P.

A moderate-sized tree with thin reddish-brown fibrous bark ; trunk generally gnarled ; branchlets slender. *Leaves* of two kinds.—of the lower branches up to 3 in. long, subulate, pungent,—of the upper, scale-like and closely adpressed (resembling those of *Cupressus torulosa*), ovate, acute, with a large dorsal gland,—all of a light-green colour. *Male catkins* terminal, on a scaly peduncle. *Berry* 2-3 in. diam., subglobose, glaucous, black when ripe, very resinous ; tips of the scales forming transverse ridges ; seeds 2-5.

TEHRI-GARHWAL along the Jádangá, a tributary of the Bhágirathi.

Sapwood large, white ; heartwood dark-red, even and close-grained, with a scent similar to that of the pencil-cedar ; weight about 32 lbs. per c. ft. It is used for fuel and occasionally burnt for incense.

3. *Taxus*, Linn.

1. *T. baccata*, Linn. ; Fl. Br. Ind. v. 648 ; Brandis For. Flora 539, Ind. Trees 696 ; Gamble Man. Ind. Timb. 701. The Yew. Vern. *Thúner*, *Thúniára*, Jaunsar.

An evergreen tree, generally middle-sized, but sometimes very large, with a large spreading crown ; bark reddish-grey, thin, smooth, peeling off in longitudinal shreds. *Leaves* distichous, 1-1.5 by 1 in., linear, often cuspidate-acuminate, dark-green and shining above, brownish-yellow and somewhat mealy beneath, 1-nerved, narrowed into a short petiole. *Flowers* usually diœcious, axillary. *Male fl.* a pediceled whorl of 3-8 anther-cells on peltate scales. *Female fl.* a single erect ovule surrounded by a disk, at the apex of a scaly peduncle. *Fruit* an ovoid berry 3-4 in. long, the disk developing into a fleshy covering which overtops and nearly conceals the compressed wingless olive-green seed ; cotyledons 2.

JAUN SAR and TEHRI-GARHWAL, 6-10,000 ft., generally in shady ravines ; common, but not abundant ; Jádi Block, Deoban ; Tútúa Block, Mundáli ; Lambátách ; Rikhsin, etc.

Sapwood white ; heartwood orange-red, close-grained, hard, smooth, elastic, works and polishes extremely well, but somewhat slow to season. Annual rings wavy. Medullary rays extremely fine, very numerous. Weight 44 lbs. per c. ft. The wood is eminently fit for cabinet-work, and is used for bows, carrying-poles and furniture. The bark is used by Kunawaris as a substitute for tea, this accounting for the long blazes usually seen on road-side trees. The fruit is eaten.

Fl. Mar.-May. Fr. Sept.-Nov.

4. **Pinus**, Linn.

Evergreen trees; branches whorled and generally horizontal. *Leaves* of two kinds; on seedlings and luxuriant shoots single and short; on older shoots and trees in bundles of 2-5 and usually long, the latter at first from the axils of the former. *Male catkins* crowded at the base of the current year's shoots. *Anther-cells* in pairs, on a short column, connected at the back by a scale-like connective which is produced at the tip, several such pairs being imbricately close-packed in each catkin. *Female cones* globose or ovoid, generally at the end of the current year's shoots; scales spirally imbricate, open at first, but closing after fertilization; ovules 2 at the axil of each scale, inverted. *Ripe cones* ovoid oblong or cylindrical, usually at the base of the current year's shoots; scales thickened and woody, beaked or with a square knob at the apex. *Seeds* with a hard woody shell, in pairs at the base of each scale, oily, generally winged; cotyledons usually more than two.

Analysis of the Species.

- Leaves in clusters of 5, bluish-green;
 cone cylindrical, with scales not much
 thickened at the apex 1. *P. excelsa*.
 Leaves in clusters of 3, light-green; cone
 ovoid, with scales much thickened
 at the apex 2. *P. longifolia*.

1. **P. excelsa**, Wall; Fl. Br. Ind. v. 661; Brandis For. Flora 510, Ind. Trees 689; Gamble Man. Ind. Timb. 704. The Blue Pine. Vern. *Kāil*, Hind.; *Chil*, Jaunsar.

A large tree; bark smooth slate-coloured and leathery on young stems, grey or greyish-brown corky and with shallow fissures on mature trees. *Leaves* in bundles of 5, 6-8 in. long, slender, triquetrous, glaucous on the inner faces (giving the foliage its

characteristic bluish colour); sheaths entire, deciduous. *Male catkins* 3-4 in. long, ovoid or oblong. *Cones* generally 2-3 together, 6-12 in. long when ripe, on peduncles 1-3 in. long, cylindrical, erect before fertilization, afterwards pendulous; scales 2-2.5 in. long, 1-1.5 in. broad near the end, spatulate, not much thickened at the end, rhomboid at the back. *Seeds* blackish, ovoid, acute at both ends, compressed .25-.35 in. long; wing about three times as long, obliquely truncate; cotyledons usually 9.

JAUNSAK and TEHRI-GARHWAL, 6,-10,000 ft., generally as a companion of Deodar, for which species, if properly guarded against, it is an excellent nurse in early life. In JAUNSAK it is seldom gregarious above 8,500 ft. Occasionally as low down as 4,000 ft., e.g., in the Giri valley, SIMLA HILLS.

Heartwood pinkish-brown, moderately, hard; annual rings distinct, marked by a line of compact wood at the outer edge; medullary rays very fine and very numerous; resin ducts smaller than those of *P. longifolia*; weight 30 lbs. per c. ft. The wood is more durable than that of chir, and is altogether a much better timber, but is seldom used beyond the hills, the plains people being doubtful of its qualities, probably from its lighter weight. The sapwood gives a resin, which, though smaller in yield per individual tree, is much superior in quality to that of *P. longifolia*. The wood of the stumps is used for torches, and tar and pitch can be extracted from it by destructive distillation. The leaves may be used to stuff cushions. In certain years a sweet liquid, commonly known as honey-dew, is secreted by some Aphids which infest the leaves of the pines and occasionally of other Coniferous trees. This sweet substance is collected and eaten by the inhabitants of the Himalaya. The bark of poles is used like slate for roofing temporary huts. The seeds are sometimes eaten, although too resinous to be much relished.

Fl. Apr. - June. Fr. ripens Sept.-Nov. of the second year.

2. *P. longifolia*, Roxb.; Fl. Br. Ind. v. 652; Brandis For. Flora 506. Ind. Trees 690; Gamble Man. Ind. Timb. 706. The Chir or Long-leaved Pine. Vern. *Chir*, Hind.; *Sarol*, Sirli, *Kulhain*, Garhwal and Jaunsar.

A large light-loving tree with a clear straight hole; bark 1-2 in. thick, outer corky and in thin crisp plates, reddish-brown.—inner brick-red, vertically and spirally furrowed; branches rough, soon corky. *Leaves* in bundles of 3, 9-12 in. long, obscurely triquetrous, light-green; sheath greyish-brown, persistent, fimbriate. *Male catkins* 3-6 in. long, ovoid-cylindric. *Cones* solitary or 3-5 together 4-8 by 3-5 in. near the base, ovoid, on short stout stalks; scales 1-2 by .7 in., beak 4-6-gonous, reflexed, much thickened,

generally with a sharp black tip. *Seeds* .3-.45 in. long, obliquely oblanceolate, compressed, with a membranous wing, which is rather longer than the seed; cotyledons about 12.

Throughout the DEHRA, SAHARANPUR and JAUNSAT DIVISIONS, between 2,000 and 6,500 ft.; generally gregarious, often forming extensive pure forests. SAHARANPUR SIWALIKS, 2,-3,000 ft.; LADUAKOT in the MALKOT HILLS, 4,-6,000 ft.; Tons and other valleys in JAUNSAT and TEHRI-GARHWAL, 3,-6,500 ft.

The heartwood is soft, reddish; annual rings well-marked by a compact belt of darker colour at the outer edge, inner zone spongy; medullary rays fine, numerous; resin-ducts prominent on a vertical section; weight about 41 lbs. per c. ft. The wood is not durable, specially when exposed to wet. It is, however, used in the hills, and is rising in the estimation of the plains people of the Punjab, where it is largely exported for building and other purposes. The sapwood yields large quantities of resin, from which turpentine and rosin are manufactured. The charcoal of the bark is much prized by Jaunsari blacksmiths. The seeds are eaten by the hill-people. Other economic uses are similar to those of Kail, excepting that the bark is never used for roofing.

Fl. Feb.-Apr. Seeds shed Apr.-May next year. The dry cones remain long on the tree.

The important article of food known throughout Northern India as *Chilghōzā* is the seed of a pine tree, *P. Gerardiana*, Wall.; Fl. Br. Ind. v. 652,—which is a native of AFGHANISTAN, KAFIRISTAN and ARID HIMALAYA. *Seeds* about .8 in. long, oblanceoloid, terete.

5. Cedrus, Loud.

1. *C. Deodara*, Loud.; Brandis For. Flora 516, Ind. Trees 691. Syn.—*C. Libani*, Barr. var. *Deodara*, Hk. f., Fl. Ind. v. 653; Gamble Man. Ind. Timb. 710. The Himalayan Cedar. Vern. (*Devadāru*, Sans., whence *Deodar*, *Dedwār*, *Deýār* Hind.); *Kelon*, Jaunsar.

A very large and tall gregarious tree, probably the largest and longest-lived in India,* noted for its great beauty: branches and branchlets horizontal, tips slender and nodding; crown from pyramidal in early life to spherical when mature; bark greyish or reddish-brown, with vertical and diagonal fissures. *Leaves* 1-1.5 in. long, acicular, triquetrous, glaucous-green, mostly in dense fascicles, with a few solitary ones scattered between the fascicles.

* There is a section in the Forest College Museum, 27 ft. in girth, the age of which is estimated to be over 800 years.

Male catkins solitary, at the ends of the branchlets, usually 3-4 in. long, ovoid. *Anthers* as in *Pinus*. *Ovules* inverted, 2 at the base of each scale. *Cones* always erect, 4-5 in. long by 3-4 in. near the base, ovoid or pyramidal; scales fan-shaped, imbricate, transversely closely-packed in the cone so as to expose only the outer edges; margins thin. *Seeds* 35-5 in. long, triangular or broadly crescent-shaped; wing triangular, 6-7 in. long; cotyledons about 10.

Deodar is found in a distinct zone of its own, which in JAUNSAK and TEHRI-GARHWAL is between 7,000 and 8,500 ft. In the lower limit the Blue Pine, and elsewhere the Spruce Fir and the Möru Oak are its constant companions.

Heartwood light yellowish-brown, fine and even-grained, moderately hard, strongly scented. Annual rings very distinct, being marked at the outer edge by a fine line of darker colour. Medullary rays generally very fine but of unequal width; no visible resin ducts. Weight 35-40 lbs. per c. ft. Deodar is one of the three most important timber trees of India, the other two being Teak and Sál. The wood is extremely durable, and is proof against white-ants, and to some extent against wet, on account of the oil which it contains. It is extensively used for building, is very much in demand for sleepers, and is the best wood for shingles in North-Western India. The oil is extracted from it by destructive distillation, and is used as a remedy for ulcers and eruptions, and also for rubbing on *sarnáís* (inflated skins used for crossing rivers) to keep them from rotting. The wood is a bad fuel.

Male fl. Sept., Oct. The cones do not begin to grow until April; they ripen and shed seeds in Oct., Nov., i.e., about 13 months after flowering.

6. *Picea*, Link.

1. *P. Morinda*, Link.; Fl. Br. Ind. v. 653; Brandis Ind. Trees 692; Gamble Man. Ind. Timb. 616. Syn.—*Abies Smithiana*, Forbes; Brandis For. Flora 525. The Himalayan Spruce. Vern. *Roi*, *Rái*, Jaunsar.

A lofty tree,* with rough greyish-white bark, exfoliating in thin orbicular scales about 1 in. in diam.; branches horizontal; branchlets slender, pendulous. *Leaves* 1-1.5 in. long, 4-sided, acicular, stiff, scattered in multifarious spirals round the branchlets (which look somewhat like bottle brushes). The bud-scales cohere to form a conical cap which falls off when the leaves open. *Male*

* Trees up to 24 ft. in girth and 210 ft. in height have been measured near Mundali, JAUNSAK, 8,800 ft.

catkins single, about .4 in. long, ovoid, in the axils of the leaves; anther-cells adnate to the stipitate scales. *Ovules* inverted, in pairs behind the carpellary scale, and in the axils of the imbricating scales of the spike which afterwards becomes the cone. *Cones* terminal, 4-6 in. long, 1.5-2 in. diam., cylindric, pendulous after fertilization, dark-brown when ripe; scales with a thin edge, smooth outside, concave, broadly obovate; base cuneate. *Seeds* about .15 in. long, obliquely oblong, dark-grey, with a broad spatulate obliquely-truncate wing which is about .5 in. long; cotyledons 8-10.

JAUN SAR and TEHRI-GARHWAL, 7,-11,000 ft., associated in Deodar forests with that species and the Mōru Oak, and in higher elevations with Silver Fir and the Kharshu Oak,—generally affecting sunny aspects.

Wood white with a brownish tinge, rather soft; medullary rays very fine and very numerous; resin-ducts scanty; weight 30 lbs. per c. ft. It is used for planks and packing-cases, and for shingles in the hills. It is an indifferent fuel, but the charcoal is fairly good. The bark is used for roofing huts, and to make water-troughs.

Fl. April. Cones ripen in Oct.-Nov.

7. *Abies*, Juss.

Tall evergreen trees. *Leaves* more or less distichous, linear, 1-nerved. *Cones* erect, cylindric, scales thin, breaking away from a persistent woody axis when ripe, the carpellary scales smaller than the placental, but sometimes longer and projecting between them; placental scales bearing at the base 2 reversed ovules.

Analysis of the Species.

- | | |
|--|-------------------------|
| Young shoots glabrous; leaves 2-3 in.
long, distichous | 1. <i>A. Pindrow</i> . |
| Young shoots with short brown hairs;
leaves 1-2 in. long, spreading in all
directions except below | 2. <i>A. Webbiana</i> . |

A. Pindrow, Spach; Brandis Ind. Trees, 392; Gamble Man. Ind. Timb. 719; Syn. *A. Webbiana* var. *Pindrow*, Brandis For. Fl. 528; Fl. Br. Ind. v. 655. Vern. *Morinda*, Jaunsar Low-level Silver Fir.

A tall evergreen tree with a dense cylindric crown of very dark foliage; bark smooth on young stems, dark grey or greyish-brown, deeply cleft with vertical fissures, when old; young shoots glabrous. *Leaves* distichous, 2-3 in. long, flattened, linear, tip notched, upper surface dark-green, shining, the lower with two pale glaucous bands on either side of the raised midrib. *Flowers* monœcious. *Male catkins* .5-7 in. long, sessile, usually clustered; *stamens* with 2 linear pollen sacs; connective produced. *Female cones* solitary or in distant pairs, erect, situated a little below the tips of the shoots. *Mature cones* cylindric, erect, 4-7 in. long by 1.5-3 in. diameter, dark purple when ripe; scales thin, obovate, edge rounded. *Seeds* .4-.5 long, wing longer than the seed.

Common in JAUNSAIR and TEHRI-GARHWAL 8,-10,000 ft. generally on northerly aspects and in shady localities, and often attains an enormous size, trees up to 250 ft. in height and 25 ft. in girth having been found at Mundali. It is important in the Deodan Range as a fuel tree.

2. *A. Webbiana*, Lindl.; Fl. Br. Ind. v. 654; Brandis For. Flora 528, Ind. Trees 692; Gamble Man. Ind. Timb. 718. The High-level Silver Fir.

A large evergreen tree with a dense cylindrical crown, young shoots usually clothed with short brown hairs; branches pendulous, branchlets stout, stiff, spreading horizontally; bark smooth on young stems, dark-brown or grey and split into long and narrow scales on old trees. *Leaves* 1-2 by .1 in., flat, narrow-linear, narrowed into a short petiole, spirally arranged but declinate on two sides to appear distichous, glossy dark-green above with two faint white lines on either side of the midrib beneath, persistent for at least three years: tip emarginate, generally with two sharp cusps. *Cones* always erect, oblong or cylindrical, shorter and thicker than in *A. Pindrow*, dark-purple when ripe; scales deciduous.

TEHRI-GARHWAL, 10,-13,000 ft., often with the Birch.

Fl. Apr. Cones ripen in Sept.-Oct.

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